



**Carleton**  
UNIVERSITY

*Education*  
for **Life**

# 2001/2002 Graduate Calendar



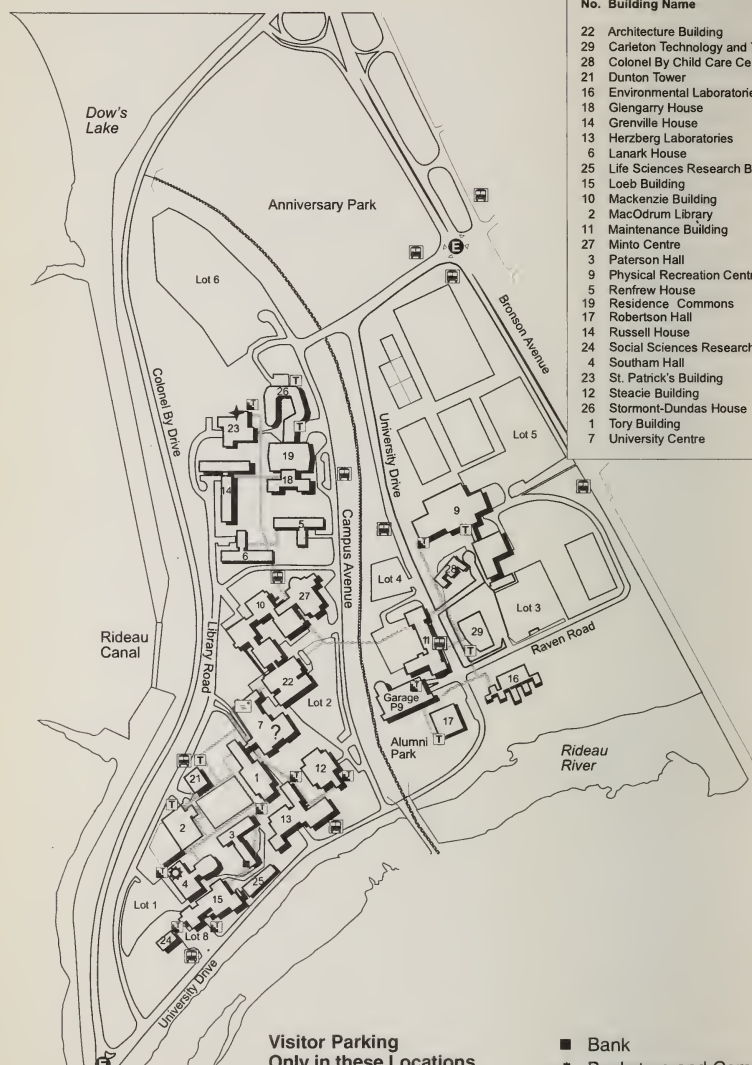
2001/2002

Graduate

Calendar

[www.carleton.ca](http://www.carleton.ca)

# Carleton University



## No. Building Name

- 22 Architecture Building
- 29 Carleton Technology and Training Centre
- 28 Colonel By Child Care Centre
- 21 Dunton Tower
- 16 Environmental Laboratories
- 18 Glengarry House
- 14 Grenville House
- 13 Herzberg Laboratories
- 6 Lanark House
- 25 Life Sciences Research Building
- 15 Loeb Building
- 10 Mackenzie Building
- 2 MacOdum Library
- 11 Maintenance Building
- 27 Minto Centre
- 3 Paterson Hall
- 9 Physical Recreation Centre
- 5 Renfrew House
- 19 Residence Commons
- 17 Robertson Hall
- 14 Russell House
- 24 Social Sciences Research Building
- 4 Southam Hall
- 23 St. Patrick's Building
- 12 Steacie Building
- 26 Stormont-Dundas House
- 1 Tory Building
- 7 University Centre

## Visitor Parking Only in these Locations

- Parking Garage (P9)
- Parking Lot 1
- Parking Lot 2
- Parking Lot 5
- Parking Lot 6
- Parking Lot 8

- Bank
- Bookstore and Computer Store
- Bus Stops
- ◆ Carleton University Art Gallery
- ⓔ Entrances to Campus
- ? Information Carleton
- ✦ Post Office
- ⌛ Tunnel Entrance
- ⌛ Tunnel Entrance with Stairs
- ⌛ Tunnels



**Carleton**  
UNIVERSITY

## **Faculty of Graduate Studies and Research**

### ***Graduate Calendar for the Academic Year 2001-2002***

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Ottawa, Canada  
K1S 5B6  
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Fax: (613) 520-4049

The Graduate Calendar is available at the Web site [www.carleton.ca](http://www.carleton.ca). Every effort has been made to ensure the accuracy of the electronic version, but in the case of any discrepancy, the printed Calendar shall be considered to be the University's official statement.

This Calendar is published several months in advance of the beginning of the academic year. The University reserves the right without liability or penalty, and without notice, to make changes in the services and programs it offers, including alteration of the fee schedule and cancellation of particular courses.

# Office of the Dean

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*Office Hours*  
September 1 to August 31  
10:00 a.m. - 12:00 noon  
1:00 p.m. - 4:00 p.m.

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## **Educational Equity Policy**

### ***Preamble***

In support of Carleton University's commitment to Section 15 of the Federal Charter of Rights and Freedoms, Sections 4 and 13 of the Ontario Human Rights Code, and the University's mission statement,

### ***Statement of Principles***

Carleton University is committed to providing equity in its educational programs and services and a welcoming environment for all individuals regardless of race, ancestry, place of origin, colour, ethnic origin, national origin, creed, sex, sexual orientation, age, marital status, family status, or disability as defined in the Human Rights Code of Ontario.

Carleton University strives for the best possible educational experience for all of its students. The University attempts, to the best of its ability, to encourage and assist all students to succeed academically and as members of the University community.

### ***Educational Equity Policy Statement***

In support of its commitment to excellence in teaching, scholarship, and research, Carleton University seeks to identify University policies, programs, and services that need to be changed, enhanced, or created, subject to the availability of resources, in order to:

- (a) increase the access, retention, and graduation of groups of students who have traditionally been under-represented, under-served, and/or disadvantaged in University programs, and
- (b) provide a supportive and welcoming learning environment for all students.

The designated groups for education equity include, but are not limited to: women; Aboriginal peoples; persons with disabilities; racial, ethnic, or visible minorities; the economically disadvantaged; mature and part-time students; gay men, lesbians, and bisexuals; and international students.

The University undertakes to provide reasonable accommodation to these groups and, to the extent that it is possible, to implement special measures to support the achievement of the University's education equity goals.

In support of its commitment to achieve and maintain a hospitable campus climate for all students, faculty, and staff, the University undertakes to provide education and training on human rights issues as these relate, inter alia, to curriculum and pedagogy.

## **Policy on Discrimination and Harassment**

Carleton University is a community of faculty, staff, and students who are engaged in teaching, learning and research. Its members are part of the community at large and are governed by the law common to all persons. But membership in the academic community also entails certain rights and responsibilities. The University respects the rights of speech, assembly, and dissent; it prohibits discrimination on the basis of race, ancestry, place of origin, colour, ethnic origin, citizenship, creed, political affiliation or belief, sex, sexual orientation, gender identity, age, marital status, family status, or disability/handicap that is defined as such in the Ontario Human Rights Code; it requires tolerance and respect for the rights of others; and it promotes an environment conducive to personal and intellectual growth.

(Please refer to Offences of Conduct, p.67.)

# The University

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  - Computer Store*
  - Computing and Communication Services*
  - Equity Services*
    - *Centre for Aboriginal Education, Research and Culture*
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  - Graduate Students' Association*
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  - Library*
  - Ombuds Services*
  - Paul Menton Centre for Students with Disabilities*
  - Student Life Services*
  - University Centre*
  - Writing Tutorial Service*

## Electronic Access to the Graduate Calendar

An electronic version of the Graduate Calendar is available on the Internet.

The electronic version is usually available within two months after the print version (i.e. by June 1). Every effort has been made to ensure the accuracy of this electronic version, but in the case of any discrepancy, the printed Calendar shall be considered to be the University's official statement.

The electronic version can be accessed by all users at [www.carleton.ca](http://www.carleton.ca). For those with campus CHAT accounts, the electronic version is also available under the Carleton Information option.

## Copyright Compliance

Carleton University is committed to compliance in all copyright matters. Noncompliance is a violation of the Canadian Copyright Act. In addition to any actions that might be taken by any copyright owner or its licensing agent, the University will take steps against any breach of this policy.

See [www.carleton.ca/ims/copyrig1.html](http://www.carleton.ca/ims/copyrig1.html) for guidelines on copyright compliance.

## The University

Carleton University is a contemporary, enterprising university situated in Canada's capital. Undergraduate and graduate programs are offered in the disciplines of arts, social sciences, engineering, and science and through many professional Schools and Institutes. Specialized research is carried out in more than 90 organized research centres. With over 17,000 full-time and part-time students from the National Capital Region, from across the country, and from more than 100 countries around the world, Carleton has acquired a reputation that is world-wide.

Founded in 1942 as a non-denominational, private, co-educational college, Carleton initially occupied a few rented classrooms in church basements and high schools in downtown Ottawa. Full-time programs were offered in 1946 in journalism and public administration. Rapid expansion during the following years led to the development of a new campus on a large and picturesque site between the Rideau River and the historic Rideau Canal.

Carleton's location in Canada's capital has shaped its philosophy and character in a special way. Throughout its history, Carleton has explored the Canadian perspective in many fields and utilized Ottawa's unique resources to give its students an advantage that few other universities enjoy. In the pursuit of academic excellence, Carleton has played a national role in contributing to the quality of public discourse in Canada and to the advancement of our country's international relations. Looking to the future, the University is at the forefront in developing new partnerships, new programs, and new directions in teaching and research that will enable its graduates to lead in meeting the challenges of tomorrow. Forging ties with business, industry, government, and other educational institutions will ensure the most relevant education and most current leading edge research.

The first undergraduate degrees, awarded in 1946, were in journalism and in public administration, and the first graduate diploma in 1954 was in public administration. Today, the University offers graduate instruction leading to the master's degree in more than 50 fields and to the doctorate in 19 areas. In 1999/2000, the Faculty of Graduate Studies and Research registered close to 2500 students in graduate level studies.

With outstanding scholars, challenging and imaginative programs, excellent students, libraries, laboratories, and other resources and facilities, the University can provide its students with the most current and relevant education. Graduate programs in Science and Engineering are enhanced by linking resources and expertise with the University of Ottawa to create institutes that are among the finest in the country. Moreover, students in all programs have access to the vast number of scholars working in government organizations and to the special facilities associated with these national and international institutions.

Carleton University's 29 buildings occupy a beautiful 62-hectare campus just 10 minutes drive south of Parliament Hill. A special feature of the campus is an extensive underground tunnel system which makes the University especially accessible for students who have mobility impairments. The Carleton University Library houses more than a million volumes and an extensive collection of microfilms, archival material, maps, documents, and prints, all accessed by an on-line catalogue system with terminals on every floor. Reading rooms and special interest resource centres are maintained by many Departments on campus. Accommodations for close to 1700 students is provided in Carleton's seven residence buildings. A new Residence building, due to open in the Fall 2001, will make an additional 400 beds available on campus to senior undergraduate and graduate students. Cafeterias throughout the campus offer meals and snacks. The physical recreation complex houses facilities for a wide range of activities from individual fitness to varsity and intramural team competition in a number of sports. Special-interest clubs, public lectures, concerts, films, live theatre, conferences, and conventions bring many dimensions to campus life.

Recreational, cultural, and leisure-time activities to suit every taste abound in the national capital area. The National Arts Centre, the Museum of Civilization, and the National Art Gallery enlighten and entertain in both English and French. Carleton boasts the world's longest winter skating rink, the Rideau Canal, at its doorstep, and miles of bike paths and walking trails surround the picturesque campus along waterways and greenbelts.

## Degree Programs

The following graduate programs are currently offered at Carleton:

*Graduate Certificate in Conflict Resolution*

*Graduate Certificate in Health and Social Policy in Development*

*Graduate Diploma in European Integration Studies*

*Graduate Diploma in Public Administration (D.P.A.)*

*Master of Architecture (M.Arch.)*

*Master of Arts (M.A.)*

Anthropology, Applied Language Studies, Canadian Art History, Canadian Studies, Central/East European and Russian-Area Studies, Communication, Comparative Literary Studies, Economics, English, Film Studies, French, Geography, History, International Affairs, Legal Studies, Philosophy, Political Economy, Political Science, Psychology, Public Administration, Religion, and Sociology

*Master of Business Administration (M.B.A.)*

*Master of Computer Science (M.C.S.)*

*Master of Engineering (M.Eng.)*

Aerospace, Civil, Electrical, Environmental, Materials, Mechanical Engineering, and Telecommunications Technology Management

*Master of Journalism (M.J.)*

*Master of Science (M.Sc.)*

Biology, Chemistry, Earth Sciences, Information and Systems Science, Mathematics, and Physics

*Master of Social Work (M.S.W.)*

*Doctor of Philosophy (Ph.D.)*

Biology, Canadian Studies (joint program with Trent University), Chemistry, Cognitive Science, Comparative Literary Studies, Communication, Cultural Mediation, Computer Science, Earth Sciences, Economics, Engineering (Aerospace, Civil, Electrical, Environmental and Mechanical), Geography, History, Management, Mathematics, Physics, Political Science, Psychology, Public Policy, and Sociology.

Joint programs with the University of Ottawa are offered in the following areas: Civil Engineering, Electrical Engineering, Mechanical and Aerospace Engineering, Biology, Chemistry, Computer Science, Earth Sciences, Mathematics and Statistics, Physics, and Economics.

The Institute of Neuroscience collaborates with the University of Ottawa to offer a Specialization in Behavioural Neuroscience.

The Departments of Biology and Chemistry offer a collaborative program in Chemical and Environmental Toxicology.

The Ottawa-Carleton Institute of Mathematics and Statistics and the Department of Epidemiology and Community Studies at the University of Ottawa collaborate to offer a Specialization in Biostatistics.

The Ottawa-Carleton Institute of Computer Science and the Department of Systems and Computer Engineering participate with ConGESE (Consortium for Graduate Education in Software Engineering) to offer a Specialization in Software Engineering.

The Norman Paterson School of International Affairs and the Common Law Section of the Faculty of Law at the University of Ottawa offer a joint Master of Arts in International Affairs and Bachelor of Laws degree (M.A./LL.B.)

## Academic Dress

The academic dress of Carleton University is a compromise between the style of hoods outlined in the American Intercollegiate Code and the dress of ancient foundations of Britain and América.

The master's hood, made of black silk, is of simple or Oxford shape with an open lining of two chevrons (red and black) on a silver field. The border of the hood denotes the degree granted, according to the following colour combinations: arts - white; journalism - white with a black cord sewn slightly in from the lower border; management studies - camel brown with a black cord sewn slightly in from the lower border; science - golden yellow; computer science - royal blue; social work - cream; architecture - cerise; engineering - orange. The Master's gowns, to be worn with the above hoods, are of full length, made of black stuff, with a gathered yoke behind, and long open-fronted sleeves.

The Doctor of Philosophy hood is also made of silk, but completely opened to show the lining, and provided with a purple border. The Doctoral gown is of full style, made of fine royal blue cloth with facings of light blue silk, with a full gathered yoke behind, and closed sleeves with an opening at the elbows.

The gown of the Honorary Doctorate of Laws, Literature, Science, Engineering, Architecture, or Fine Arts is a blue robe with bell-shaped sleeves, made of fine royal blue cloth with facings and sleeves in light blue silk. The hood is made of the same material as the gown, has the same lining as that for the degrees granted by examination, and is bordered with purple for the degree of Doctor of Laws, vibrant blue for the degree of Doctor of Literature, dark red for the degree of Doctor of Science, orange for the degree of Doctor of Engineering, cerise for the degree of Doctor of Architecture, and dark cardinal for the degree of Doctor of Fine Arts.

# Academic Schedule

The following schedule contains the dates prescribed by the University Senate for academic activities. Dates relating to fee payment, cancellation of course selections, late charges, and other fees or charges will be published in the Important Dates and Deadlines section of the 2001-2002 Registration Instructions and Class Schedule booklet.

## Spring/Summer Term 2001

### May 11

Last day for submission to the Office of the Faculty of Graduate Studies and Research of the five (5) final copies of Master's and Ph.D. theses for Spring convocation.

### May 16

Spring/summer-term classes begin (full-session and First-term courses).

### May 21

Statutory holiday. University closed.

### May 24

Last day for registration for spring/summer term. Last day for course changes for First-term evening division courses and for evening division full-session courses. Students who have not yet deposited five (5) final copies of their thesis in the Office of the Faculty of Graduate Studies and Research must register.

### June 8

Last day for withdrawal from First-term courses.

### June 14-16

Spring Convocation for the conferring of degrees.

### June 26

Last day for classes for First term. (Full-session courses resume July 4.)

### June 27-29

First-term final examinations may be scheduled. **It may be necessary to schedule examinations for evening classes during the day and vice versa.**

### July 2

Statutory holiday. University closed. Evening classes missed may meet on July 13.

### July 3

Second-term classes begin.

### July 27

Last day for withdrawal from full-session courses and Second-term courses.

### August 6

Civic holiday. University closed. Evening classes missed may meet August 10.

### August 10

Last day for spring/summer-term classes.

### August 11-15

Spring/summer-term examinations may be scheduled as announced. **It may be necessary to schedule examinations for evening classes during the day and vice versa.**

## Fall Term 2001

The Faculty of Graduate Studies and Research normally admits students to begin their programs in the Fall term. However, some academic units may consider applicants in the Winter term or the Spring/Summer term. Applications for admission may be submitted at any time. Applications from outside Canada should be completed at least five months before the desired date of admission in order for students to make the necessary visa arrangements.

Applicants wishing to be considered for financial assistance from Carleton University are reminded that they must submit their completed applications before March 1. Please note that some schools and departments may require completed applications prior to March 1. Students must refer to departmental entries in this calendar for details.

### August 1

Last day for submission to the thesis supervisor of six (6) examination copies of Master's and Ph.D. theses for Fall graduation.

### September 1

Last day for receipt of applications for degrees from potential Fall graduates.

### September 3

Statutory holiday, University closed. PrepWeek activities continue.

### September 4

Fall term begins.

### September 1-8

PrepWeek. Academic and social orientation to the campus.

### September 4-5

Academic Orientation. **All students are expected to be on campus.** Class and laboratory preparations, departmental introductions for students, and other academic preparation activities will be held.

**Note:** Some graduate courses in joint programs with the University of Ottawa will begin formal classes on this date. Graduate students are advised to check with their departments for details.

### September 5

Orientation for Graduate Teaching Assistants.

## September 6

Graduate Fall and Fall/Winter classes begin.

## September 21

Last day for registration. Students who have not yet deposited the five (5) final copies of their thesis in the Office of the Faculty of Graduate Studies and Research must register.

Last day to change courses or sections for Fall/Winter and Fall-term courses.

## October 5

University Day at Carleton. Undergraduate classes suspended.

## October 8

Statutory holiday, University closed.

## October 12

Last day for submission to the Office of the Faculty of Graduate Studies and Research of five (5) final copies of Master's and Ph.D. theses for Fall graduation.

## November 2

Last day to withdraw from Fall-term courses.

## November 18

Fall convocation for the conferring of degrees.

## December 1

Last day for receipt of applications from potential Winter (February) graduates

Last day for submission to the thesis supervisor of six (6) examination copies of Master's and Ph.D. theses for Winter graduation.

## December 3

Last day of Fall-term classes.

Fall Term ends.

## December 6 - 22

Final examinations in Fall term courses and mid-term examinations in Fall/Winter courses will be held. **It may be necessary to schedule examinations during the day for classes held in the evening and vice versa.**

## Winter Term 2002

### January 2

Winter term begins.

### January 3

Winter term classes begin.

### January 18

Last day for late registration for Winter-term courses.

Students who have not yet deposited the five (5) final copies of their thesis in the Office of the Faculty of Graduate Studies and Research must register.

Last day to change courses or sections for Winter-term courses.

## January 30

Last day for submission to the Office of the Faculty of Graduate Studies and Research of the five (5) final copies of Master's and Ph.D. theses for Winter (February) graduation.

## February 1

Last day for receipt of applications from potential Spring graduates.

## February 18 - 22

Winter Break, classes suspended.

## March 1

Last day for receipt of applications for admission from candidates who wish to be considered for the initial award (April) of financial assistance (including Carleton fellowships, scholarships, and departmental assistantships) administered by Carleton University. Candidates whose applications are received after the March 1 deadline date may be eligible for the award of a fellowship, scholarship, or assistantship by reversion.

Last day for submission to the thesis supervisor of six (6) examination copies of Master's and Ph.D. theses for Spring graduation.

## March 8

Last day to withdraw from Fall/Winter and Winter-term courses.

## March 29

Statutory holiday, University closed

## April 4

Last day of Fall/Winter and Winter-term classes.

Classes scheduled on this day will be those appropriate to a Friday. Some graduate courses may continue during Review Week until the end of Winter term on April 9.

## April 5 - 9

Review Week.

Some lectures, laboratories, review tutorials, etc. may take place.

## April 9

Winter term ends.

## April 11 - 29

Final examinations will be held. **It may be necessary to schedule examinations during the day for classes held in the evening and vice versa.**

## June 13 - 15

Spring convocation for the conferring of degrees.

## 2001

JANUARY						FEBRUARY						MARCH						APRIL									
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
1	2	3	4	5	6	7				1	2	3	4				1	2	3	4	5	6	7				
8	9	10	11	12	13	14	5	6	7	8	9	10	11	5	6	7	8	9	10	11	8	9	10	11	12	13	14
15	16	17	18	19	20	21	12	13	14	15	16	17	18	12	13	14	15	16	17	18	15	16	17	18	19	20	21
22	23	24	25	26	27	28	19	20	21	22	23	24	25	19	20	21	22	23	24	25	22	23	24	25	26	27	28
29	30	31					26	27	28					26	27	28	29	30	31		29	30					

MAY						JUNE						JULY						AUGUST										
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
	1	2	3	4	5	6				1	2	3		1	2	3	4	5	6	7				1	2	3	4	5
7	8	9	10	11	12	13	4	5	6	7	8	9	10	8	9	10	11	12	13	14	6	7	8	9	10	11	12	
14	15	16	17	18	19	20	11	12	13	14	15	16	17	15	16	17	18	19	20	21	13	14	15	16	17	18	19	
21	22	23	24	25	26	27	18	19	20	21	22	23	24	22	23	24	25	26	27	28	20	21	22	23	24	25	26	
28	29	30	31				25	26	27	28	29	30		29	30	31					27	28	29	30	31			

SEPTEMBER						OCTOBER						NOVEMBER						DECEMBER									
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
					1	2	1	2	3	4	5	6	7				1	2	3	4						1	2
3	4	5	6	7	8	9	8	9	10	11	12	13	14	5	6	7	8	9	10	11	3	4	5	6	7	8	9
10	11	12	13	14	15	16	15	16	17	18	19	20	21	12	13	14	15	16	17	18	10	11	12	13	14	15	16
17	18	19	20	21	22	23	22	23	24	25	26	27	28	19	20	21	22	23	24	25	17	18	19	20	21	22	23
24	25	26	27	28	29	30	29	30	31					26	27	28	29	30			24	25	26	27	28	29	30
																					31						

## 2002

JANUARY						FEBRUARY						MARCH						APRIL										
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
	1	2	3	4	5	6					1	2	3					1	2	3		1	2	3	4	5	6	7
7	8	9	10	11	12	13	4	5	6	7	8	9	10	4	5	6	7	8	9	10	8	9	10	11	12	13	14	
14	15	16	17	18	19	20	11	12	13	14	15	16	17	11	12	13	14	15	16	17	15	16	17	18	19	20	21	
21	22	23	24	25	26	27	18	19	20	21	22	23	24	18	19	20	21	22	23	24	22	23	24	25	26	27	28	
28	29	30	31				25	26	27	28	29			25	26	27	28	29	30	31	29	30						

MAY						JUNE						JULY						AUGUST										
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
			1	2	3	4	5					1	2				1	2	3	4					1	2	3	4
6	7	8	9	10	11	12	3	4	5	6	7	8	9	8	9	10	11	12	13	14	5	6	7	8	9	10	11	
13	14	15	16	17	18	19	10	11	12	13	14	15	16	15	16	17	18	19	20	21	12	13	14	15	16	17	18	
20	21	22	23	24	25	26	17	18	19	20	21	22	23	22	23	24	25	26	27	28	19	20	21	22	23	24	25	
27	28	29	30	31			24	25	26	27	28	29	30	29	30	31					26	27	28	29	30	31		

SEPTEMBER						OCTOBER						NOVEMBER						DECEMBER											
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S		
1	2	3	4	5	6	7				1	2	3	4	5	6				1	2	3		1	2	3	4	5	6	7
8	9	10	11	12	13	14	7	8	9	10	11	12	13	4	5	6	7	8	9	10	8	9	10	11	12	13	14		
15	16	17	18	19	20	21	14	15	16	17	18	19	20	11	12	13	14	15	16	17	15	16	17	18	19	20	21		
22	23	24	25	26	27	28	21	22	23	24	25	26	27	18	19	20	21	22	23	24	22	23	24	25	26	27	28		
29	30						28	29	30	31				25	26	27	28	29	30		29	30	31						

# Course Designation System

## Prefix Numbering

Each course number is prefixed by the number or numbers of the department, institute, or school under whose auspices the course is offered.

- 03 Interdisciplinary Social Sciences
- 07 Cognitive Science
- 09 Women's Studies
- 11 Art History
- 12 Canadian Studies
- 17 Comparative Literary Studies
- 18 English
- 19 Film Studies
- 20 French
- 22 German
- 24 History
- 25 Cultural Mediations
- 28 Journalism and Communication
- 29 Linguistics and Applied Language Studies
- 30 Music
- 32 Philosophy
- 34 Religion
- 38 Spanish
- 42 Business
- 43 Economics
- 44 Political Economy
- 45 Geography
- 46 International Affairs
- 47 Political Science
- 49 Psychology
- 49 Specialization in Neuroscience
- 50 Administration
- 51 Law
- 52 Social Work
- 53 Sociology
- 54 Anthropology

- 55 European and Russian Studies
- 61 Biology
- 65 Chemistry
- 67 Earth Sciences
- 70 Mathematics and Statistics
- 74 Physics (joint program) offered at University of Ottawa
- 75 Physics
- 76 Architecture
- 77 Architecture
- 78 Architecture
- 81 Environmental Engineering
- 82 Civil Engineering
- 83 Civil Engineering (joint program) offered at University of Ottawa
- 85 Industrial Design
- 88 Mechanical and Aerospace Engineering
- 89 Mechanical and Aerospace Engineering (joint program) offered at University of Ottawa
- 92 Electrical Engineering (joint program) offered at University of Ottawa
- 93 Information and Systems Science
- 94 Systems and Computer Engineering
- 95 Computer Science
- 96 Telecommunications Technology Management
- 97 Electronics

## Course Numbering Pattern

The course numbering pattern is, in general, as follows:

- 001-099 Courses usually taken in Qualifying University year
- 100-199 Courses usually taken in First year
- 200-299 Courses usually taken in Second year
- 300-399 Courses usually taken in Third year
- 400-499 Courses ordinarily taken in Fourth-year engineering, architectural studies, and fourth-year (honours) arts, social sciences, science, and computer science
- 500-599 Courses ordinarily taken by graduate students
- 600-699 Courses ordinarily taken by graduate students

## Hours of Operation

### Bookstore

The following hours are subject to change.

Monday to Thursday 8:30 A.M. - 7:00 P.M.

Friday 8:30 A.M. - 4:30 P.M.

There will be no refunds or exchanges without the Bookstore cash register receipt. Refer to the Bookstore refund/exchange policy, located in the store, for further details.

### Library

The following hours are subject to change.

*Fall/Winter Terms*

Monday to Friday 8:00 A.M. - 11:00 P.M.

Saturday and Sunday 10:00 A.M. - 11:00 P.M.

*Spring/Summer Intersessions*

Monday to Friday 8:30 A.M. - 4:30 P.M.

Saturday and Sunday Closed

*Summer Term*

Monday to Thursday 8:30 A.M. - 10:00 P.M.

Friday 8:30 A.M. - 5:00 P.M.

Saturday Closed

Sunday 12:00 NOON - 5:00 P.M.

The Library closes for all holidays except Good Friday and Easter Monday.

For current Library hours, call (613) 520-5621 or visit the Library's web site at [www.library.carleton.ca](http://www.library.carleton.ca).

## Student Services

### Athletics and Recreation

Telephone: 520-4480

The mandate of the Department of Physical Recreation and Athletics is to enhance campus life, spirit, and health by providing a variety of opportunities for high-quality physical activity which meet the needs of students and staff. A balance of programs is offered for all skill and competitive levels, including freelance recreation, instruction programs, intramural sports, and interuniversity athletics.

The athletic facilities include an L-shaped fifty-metre pool with diving tower; a Fitness Centre with weight-training equipment, and cardiovascular machines; nine International squash courts; a double gymnasium; a heavy-weight training room; and Combatives and Multipurpose rooms. Outdoor facilities include football and soccer fields, three other playing fields, and five tennis courts. These facilities may be available to students either for recreational needs or for organised competition.

Instructional classes offered include group fitness programs such as aerobics, weight-training, and step aerobics; personal training services; fitness appraisals; aquatics programs such as learn-to-swim, aquafit, and masters' swim; dance; martial arts; yoga and tai chi.

For further information on varsity athletics, competitive club teams and intramurals, contact the Athletics department or visit our website at [www.carleton.ca/athletics](http://www.carleton.ca/athletics).

Full-time graduate students are eligible for interuniversity athletics, subject to league regulations. There is an Athletics Board which advises the Department and the University on matters of athletics and recreation policy through the Office of the President. The Board is composed of members from the Faculty, Administration, Alumni, the Students' Associations, and the Residence Association.

### Bookstore

Telephone: 520-3832

The University Bookstore, located in Southam Hall, stocks required textbooks and offers a wide selection of scholarly and general books. A complete line of school supplies and insignia clothing and gifts is also available.

Bookstore hours are: Monday through Thursday, 8:30 a.m. to 7:00 p.m., Friday 8:30 a.m. to 4:30 p.m. Hours are subject to seasonal changes and will be posted at the Bookstore entrance. Customers are urged to call ahead if they are not clear on the hours.

The Bookstore's refund/exchange policy requires merchandise to be returned within 48 hours of purchase. There is an extended refund period at the beginning of each term. Customers are urged to review the policy before making a purchase. The cash register receipt is required for any refund or exchange.

### Career Services

508 University Centre

Telephone: 520-6611

TDD: 520-3937

Fax: 520-5695

Website: [www.carleton.ca/career](http://www.carleton.ca/career)

Email: [career@carleton.ca](mailto:career@carleton.ca)

Career Services (CS) is the campus career and employment centre. It provides students and alumni with the resources and materials they need to explore career choices/options and embark on their job search. Services provided by this office include:

### Resource Centre

The resource centre provides students with tools to research educational, employment, and career planning resources. Materials available include: job search materials, work abroad information, occupational and labour market trends, university and community college calendars, company videos and CD Roms, magazines and periodicals, starting your own business guides, salary information, an assortment of employment directories and information on various associations. Some of these resources are available for loan. A computer lab is available for on-line job searching and resume preparation. The Resource Centre also houses the volunteer centre, which offers hundreds of volunteer opportunities.

### Career Counselling and Employment Advising

Career counselling assists students in learning to plan wisely and to handle concerns with regards to selecting academic majors and/or selecting career fields. The Career Planning Workshops are offered to help students in becoming aware of different career fields and how they relate to academic majors. There are two assessments which are used to assist students to acquire knowledge about their personality and interests as they pertain to the world of work. In addition, employment workshops such as Resume/Cover Letter Writing, Job Search and Networking, and Interview Skills are offered on a weekly basis to prepare students for entry into the workforce. There are drop-ins as well, to provide students with individualized guidance on career and/or employment related concerns. Register to attend our workshops by signing up with our reception staff. Drop-ins are held weekly on a first-come, first-served basis, for up to 20 minutes.

### Job Postings

Career Services has incorporated Campus WorkLink, an Internet-based campus recruitment tool, to advertise all job postings targeted to Carleton students and recent graduates. Students and recent graduates have access to on-campus recruitment, full-time, part-time and summer job postings and internship programs 24 hours a day, 7 days a week.

Campus WorkLink is a free service for Carleton students and recent graduates which provides easy access to job postings, to place an on-line resume, to apply electronically to employment opportunities, to research various companies, and to gather information on educational institutions, courses and programs.

Campus WorkLink can be accessed through [www.campusworklink.com](http://www.campusworklink.com). Visit Career Services for more information about Campus WorkLink and to obtain the Carleton password to access Campus WorkLink.

### Career Fairs and Events

Career Services hosts a variety of career events, the largest being the annual Career Fair. In 2001, the Career Fair will be held on September 26<sup>th</sup> in the Athletics Centre. Employers attend the fair and are interested in recruiting students from a variety of backgrounds. Annual events include the Summer Job Fair, held in January. Events are also held throughout the year for alumni and students that include visits from employers, associations and post-secondary institutions as well as different panels on career choices. Events are listed on our website ([www.carleton.ca/career](http://www.carleton.ca/career)) or are frequently advertised in the *Charlatan* and our bi-annual newsletter, *The Explorer*. Employment Information Events

Throughout the year, CS organizes a number of career and employment information events for students and recent graduates, to provide them with the opportunity to gather information on various career possibilities. Some of these sessions may include on-campus visits from various employers and associations to discuss career opportunities, information sessions on government employment programs, and presentations from various representatives to provide students and recent graduates with information on working abroad.

### Graduate Year Recruitment Program

Employers from both the private and public sectors recruit Carleton University graduating students for permanent employment opportunities, available at the end of the academic terms. Positions advertised through the program are of a professional nature. Students seeking employment through the Graduate Year Recruitment Program must be in their graduating and final year of studies at Carleton University. The recruiting season takes place during both the fall and winter terms. Graduate

Year Recruitment job postings are advertised on-line through Campus WorkLink website: [www.campusworklink.com](http://www.campusworklink.com). Visit the Career Services office for the Carleton password and instructions on how to register with Campus WorkLink. Graduate Year Recruitment information and events, as well as other employment activity will also be advertised through Campus WorkLink, and through our *Charlatan* ads.

### Alumni Services

Alumni Services is designed to assist recent graduates in finding immediate, full-time employment. Register on-line through Campus WorkLink so that Career Services can keep in touch with you regarding upcoming events and programs. Attending workshops designed especially for recent graduates, will help you make a successful transition from school to the world of work. Find out about career related events and workshops organized by Career Services.

### Computer Lab

Students and alumni have access to computer work stations for resume and cover letter preparation, researching employers via the Internet and accessing on-campus recruiting, full-time, part-time and summer job postings directed toward Carleton students and recent graduates through Campus WorkLink, [www.campusworklink.com](http://www.campusworklink.com). Students are required to book computer time with the front desk staff and obtain the Carleton password to Campus WorkLink.

### Newsletter

Career Services publishes the *Explorer* which is filled with invaluable information and articles on career planning, resume preparation, job searching tips and interview techniques. The *Explorer* will also advertise upcoming employment programs, events and activities scheduled to take place throughout the academic terms. Stay informed, watch for our publication available at Career Services.

### Carleton University Students' Association

University Centre 401  
Telephone: 520-6688  
Fax: 520-3704

The Carleton University Students' Association (CUSA) is an incorporated, student-run organization that promotes the interests of the student body. All registered full or part-time undergraduate students are members of CUSA.

CUSA represents the students' interests to all levels of government and administration. It is also a member of the Canadian Federation of Students (CFS) and CFS-Ontario. These two organizations are committed to bringing about necessary educational, administrative and/or legislative changes in those areas affecting students.

Student services funded wholly or in part or operated by CUSA include: Career and Placement Services (by direct student levy); Carleton Disability Awareness Centre; Carleton Foot Patrol; Gay, Lesbian, Bisexual and Transgendered Centre; Information Carleton; International Students' Centre; Mature and Part-time Students' Centre; New University Government; Off-Campus Students' Lounge; Photo Centre; Women's Centre; and the Volunteer Centre.

CUSA business ventures include: Oliver's Pub and Patio; Rooster's Coffeehouse; Unicentre Store; and a Canada Post outlet.

The legislative body of CUSA is a 34 member Students' Council made up of representatives from each faculty and a President and Finance Commissioner who are elected annually by the student population. Elections take place in February. The term of office is twelve months commencing the following May.

CUSA also sponsors more than 100 clubs and societies, alternate education programs, speaker series, and concerts.

The Students' Association is continually working to improve and expand its scope of activities. Students are encouraged to communicate ideas and opinions to members of their elected representatives in CUSA, to participate and become actively involved in the activities of the Association, and to exercise their voting privileges.

## The Chaplaincy

Protestant-Ecumenical Chaplaincy  
T28, T30 Tory Tunnel  
Telephone: 520-4449  
*Chaplain*, Reverend Tom Sherwood

Roman Catholic Chaplaincy  
127G University Centre  
Telephone: 520-2896 or 520-2590  
*Chaplain*, Father Don Maclellan  
*Assistant Chaplain*, Deacon Derek G. Smith

For over three decades a chaplaincy service has existed at Carleton. Part of its function is to share experiences, insights, friendships and our faith. We are also involved in study and discussion groups, community projects, development education, marriage preparation and religious services. In addition, we have connections with many organizations and resources on campus as well as with churches and religious groups in the Ottawa area.

The two principal chaplains (Protestant-Ecumenical and Roman Catholic) are supported by a number of people in the Chaplaincy offices, which are open most days. Appointments are not necessary but at times they are advisable. People are encouraged to visit the offices at any time.

Next to the offices in the Tory Tunnel there is a Quiet Room, which is used for individual meditation, religious services (times posted), and prayer group activity. It is open all day, five days a week. Check with the Chaplaincy office regarding special services.

## Colonel By Child-Care Centre

Telephone: 520-2715  
Fax: 520-3992

Colonel By Child Care Centre has been providing non profit Child Care on the Carleton University campus for over 20 years. Qualified teachers care for 57 children between the ages of 6 months and 5 years. The Centre operates twelve months a year, Monday to Friday from 8:00 a.m. to 5:45 p.m. Fee subsidies from the Regional Municipality of Ottawa-Carleton are available for families who meet the criteria.

As there is a waiting list, parents are encouraged to apply as early as possible.

For further information, please contact Margot Henderson.

## Computer Store

Telephone: 520-3699

The Computer Store, located in Southam Hall, carries a full range of computer products, (including Apple, IBM, NEC Bell, and Compaq computers, printers, modems, software and other peripherals) at very competitive prices, for students, faculty and staff.

Store hours:  
Monday to Friday  
8:30 a.m. - 4:30 p.m.  
Closed weekends and statutory holidays.  
Summer hours are posted at the entrance.

## Computing and Communications Services

401 Robertson Hall  
Telephone: 520-3700

A wide range of computer services are available to students. There are several Sun systems running Unix, as well as a number of microcomputer networks. All students are eligible for accounts on the CHAT system, an electronic communication system for e-mail, course discussion groups and Internet access. Also, all students have access to word processing spreadsheet and database software as well as laser printing facilities and CD-ROM services at the microcomputer labs on campus. Student Consultants are available at the microcomputer labs during peak times.

Comprehensive data analysis packages such as SAS, SPSS, Maple, Mathematica and Matlab are available for general research applications.

Complete information about computing on campus is available to all students through the campus-wide information gopher see [www.carleton.ca/CCS](http://www.carleton.ca/CCS).

For information or assistance, please visit the CCS Help Desk in 401 Robertson Hall or call 520-3700. Handouts on various computing topics are available for pick up.

## Equity Services

22<sup>nd</sup> Floor Dunton Tower  
Director, Ingrid Wellmeier

Equity Services consists of the Centre for Aboriginal Education, Research and Culture, the Mediation Centre, the Race Equity Office and the Status of Women Office. The role of Equity Services at Carleton is to promote equity, accommodate diversity and prevent discrimination. Proactive work includes workshops on diversity, cultural sensitivity, anti-racism, conflict resolution, mediation, harassment prevention as well as research on aboriginal issues. Each office has an extensive collection of publications and up-to-date research in their respective areas. Staff mediates conflict between individuals or among groups, works to resolve complaints of harassment or discrimination and provides advice to students, staff and faculty.

Equity Services is largely responsible for the implementation of Carleton's new comprehensive Human Rights Policies and Procedures starting in May 2001. This policy outlines our commitment to prevent discrimination and harassment in sections entitled: "Anti-Racism and Ethnocultural Relations Policy; Gender Equality Policy; Sexual Orientation Equality Policy; an Sexual Harassment Prevention Policy". The new policy also includes a section on Educational Equity which reinforces the university's commitment to "equity in educational programs and services" and designates Equity Services as a resource for students needing accommodation based on religious or parental and family obligations. This policy can be found on our website - go to [www.carleton.ca/equity](http://www.carleton.ca/equity).

## The Centre for Aboriginal Education, Research and Culture

2205 Dunton Tower  
Telephone: 520-2600 ex. 4500/8165  
Fax: 520-2512  
Director, To be announced

The CAERC exists to ensure Aboriginal representation and presence on campus. It provides consultative services on First Nations, Metis and Inuit matters and pursues specific educational, research and cultural projects in co-operation with students, faculty, staff and the community at large.

The CAERC is also host to the Carleton First Nations student club.

## The Mediation Centre

2213 Dunton Tower  
Phone: 520-5765  
Fax: 520-4024  
Email: [rramkay@ccs.carleton.ca](mailto:rramkay@ccs.carleton.ca)

The Mediation Centre offers assistance to individuals and groups in conflict at the University. Students, staff and faculty can access the Centre for free. Training, group facilitation, mediation, conciliation, chairing of meetings, strategic planning leadership, prevention and de-escalation, team building and problem-solving facilitation, consultation and advice are available upon request from the Centre. The Mediation Centre uses a collaborative problem-solving process by which individuals and groups in conflict identify and resolve their problems with their conflicts with the help of an impartial third party who has no decision-making power. Roommate, landlord-tenant, interpersonal relationships, neighbourhood, sexual harassment, and human rights are some of the disputes handled through the Centre.

Every September, the Centre recruits volunteers among faculty, staff, students and Ottawa South residents and trains them as mediators. Please contact the Centre if you are interested in becoming a volunteer. The Centre also offers academic and teaching support and hosts an annual Symposium on Conflict Resolution in February. Please contact the Centre for more information.

## Race Equity Office

2209 Dunton Tower  
Telephone: 520-5645  
Fax: 520-4037

Co-ordinator, Dr. Edward Osei Kwadwo Prempeh

Carleton University is host to students from various racial, cultural and ethnic backgrounds. The University has a well-established reputation for its commitment to excellence in diversity, and the Race Equity Co-ordinator works collaboratively with a wide range of students, faculty, staff and senior administrators to promote diversity as an institutional value and develop campus-wide educational programs to assist in broadening their knowledge and sensitivity to cultural and racial diversity.

The Office deals with complaints of racial discrimination and harassment and provides a confidential advisor service to complainants. The Office also offers workshops on topics such as employment and educational equity, 'chilly climate', and racism. These workshops are available to campus groups, student organizations, departments, classes, or by request.

### Status of Women Office

2201 Dunton Tower  
Telephone 520-5622  
Fax: 520-4037

Ingrid Wellmeier

Staff in the Status of Women Office work with various committees on campus to improve women's access to education, employment and services. Assistance is provided in locating childcare, resolving harassment complaints, personal and campus safety, date rape and sexual assault, lack of accessibility, sexism, employment and education equity, and chilly climate. Services are available to all students, faculty and staff.

### Graduate Students' Association

University Centre 600  
Telephone: 520-6616  
Fax: 520-3680  
Email: gsa@carleton.ca

The Graduate Students' Association (GSA) represents the collective interests and promotes the general welfare of the graduate students of Carleton University. The Association promotes and maintains communications between the graduate students and the University administration and represents graduate students within the University. The GSA can aid individual graduate students with specific problems related to the University community. The Association also acts to stimulate social, intellectual and political contact among graduate students.

The GSA Council is comprised of annually elected student representatives from each department, a four-member Executive (Internal Directors) and two External Directors. The Council meets on a monthly basis. For more information on becoming a GSA Councilor, contact the GSA office.

The Association owns and operates two separate lounges: Mike's Place (520-6681), a pub on the second level of the Unicentre; and the Gekko Grotto (ext. 8783), a coffee and computer lounge on the sixth level of the Unicentre. For full information on GSA services, please refer to the Graduate Student Handbook: Manual and Daily Planner, available from the GSA, your department, or Graduate Studies.

### Health and Counselling Services

Suite 2600  
Carleton Technology and Training Centre  
Telephone: 520-6674

Health and Counselling Services is your wellness centre at Carleton University. The centre offers a wide range of services, including treatment of illness, immunizations, birth control information, travel medicine information, a health education program, and much more. Our counsel-

ling services has professionally trained counsellors and psychiatrists to help with personal and emotional difficulties. All health records are confidential and will not be released to anyone without client written consent.

Our hours are from 8:30 a.m. to 4:30 p.m. (May - August) and 8:30 a.m. to 5:30 p.m. (September - April). Appointments are encouraged and may be made in person or by calling 520-6674. If you feel you need medical assistance before an available appointment, please feel free to walk in and a member of our health care team will make an initial assessment and direct further care as needed.

After-hours medical services are available from Holland-Carling After Hours Clinic located at 476 Holland Ave., (at Carling), phone 722-9689. When you call to book an appointment please identify yourself as a Carleton student.

Psychiatrists are available on a referral basis for those requiring psychiatric assessment or care. The services provided are available to all students of the University, and are covered by provincial health insurance.

Counsellors are available to see students on a self-referral basis. Along with regular counselling appointments, our counselling staff offers "drop-in" times daily, for students needing short but immediate contact with a counsellor. Personal counselling can help individuals deal more effectively with emotional and social concerns.

A Health Education Program, promoting healthy lifestyles and wellness, offers on-going workshops presented by trained student peer educators. Topics include, but are not limited to, nutrition, alcohol, sexuality, stress management and smoking cessation. For more information, call the Health Educator at 520-6676.

### Health Insurance

#### 1. Ontario Students

Carry your health insurance number with you at all times. If you do not have one, application for coverage must be made directly with the Ministry of Health at 75 Albert Street in Ottawa.

#### 2. Students from Another Province

If you are from outside of Ontario, check that your health insurance is active and carry your number with you at all times. We don't bill you, we bill your provincial insurance plans directly.

#### 3. Students from Outside Canada

The University Health Insurance Plan (UHIP) is compulsory for all international students upon registration. Further information regarding UHIP may be obtained from the foreign student advisor, the International Student Centre or Carleton International.

If you do not have any health insurance, you may be billed for services rendered. The University may withhold the marks of students with outstanding accounts.

## Immunization Record

It is recommended that new students:

1. Check with your family physician to ensure adequate immunization. An updated tuberculin skin test is recommended.
2. Obtain documentation of vaccination to red measles, German measles, mumps, polio and tetanus from your family physician. A booster dose of measles/mumps/rubella vaccine is recommended if you have not been re-immunized since infancy.
3. Discuss Hepatitis B vaccine with your family physician. The Medical Office of Health for Ottawa-Carleton region strongly recommends it for all adolescents and young adults.

## Housing and Food Services

261 Stormont House

### Residences

Telephone: 520-5612

Fax: 520-3952

Email: accommodations@carleton.ca

By September 2001, Carleton's student Residence complex is expected to provide accommodation on campus for 2,180 students. A new Residence building, designed to provide single room accommodation for 395 students, is presently under construction. Graduate students will be accommodated on the two upper floors of this new building. Senior undergraduate students will be assigned to the lower three and a half floors of the same structure. Each living unit on the graduate student floors will consist of two single study bedrooms, a three piece bathroom and an area for preparing and eating meals, equipped with a refrigerator and a two burner counter cook top.

The study bedrooms will be furnished with a double bed and mattress, desk, chair, bookshelf, closet and drawers for clothing and personal items.

A telephone, with access to a long distance service provider, will be provided to each resident. The cost of the local telephone service is included in the Residence fee. The study bedrooms are also equipped with connections to access the Carleton University computer system. Activating this connection requires payment of an additional fee.

As the new Residence will include meal preparation facilities, students living there will not be obligated to purchase a Residence cafeteria meal plan. Residence cafeteria meal plans that will be available, should a student living in the new Residence wish to purchase one, presently include Plan A (lunch and dinner in the Residence cafeteria 7 days/week); Plan B (any 12 meals in the Residence cafeteria each week, plus a \$300 cash component that may be spent

at any University-operated campus food service); Plan C (any 9 meals in the Residence cafeteria each week, plus a \$750 cash component that may be spent at any University-operated campus food service).

An additional and optional meal plan, designed particularly for the students in the new Residence, is presently being considered.

There are no facilities on campus for married students. Graduate students wishing to apply to live in residence should make inquiries to the office of the Faculty of Graduate Studies and Research.

### Off-Campus Housing

Telephone: 520-5614

The Off-Campus Housing Service is designed to provide assistance in finding suitable accommodation to students who cannot be accommodated on campus or who are interested in off-campus housing. This service mainly operates on a self-help basis, with listings of accommodation posted outside 261 Stormont House for viewing 24 hours per day, seven days a week. During normal office hours, staff members are pleased to assist with information, advice, etc. In addition, the Off Campus Centre, located in 211 Residence Commons Building, operates from 8:30 a.m. - 4:30 p.m. during the months of July and August. Staff of the Centre provide personal assistance and further information.

Details regarding each listing include rates and amenities provided. The University does not undertake to inspect or approve any of the facilities listed, so it is strongly advised that the search be undertaken in person. The listings can also be viewed on the Housing and Food Services web site at [www.carleton.ca](http://www.carleton.ca).

In addition, a newsletter titled "Faculty and Staff Listing" is published on the 15th of every month. (Deadline for submissions is the 13th.) This lists accommodations of staff members going on sabbatical leave for periods ranging from four months to two years. Lists are distributed to each department on campus and are available on the website noted above.

### Food Services

Telephone: 520-5612

Chartwells College & University Dining Services: 520-5618

A-la-carte food service is available in eight locations across campus:

The Food Court, offering Mr. Submarine, Arrriba, Harvey's, Market Grill and Pizza Pizza, second level, University Centre; The Second Cup, first level, University Centre; Rooster's Wing, fourth level, University Centre; The Loeb Cafe, first level, Loeb Building; Junction Second Cup, Library precinct, Tunnel level; The Oasis Caf-

eteria, first level, Residence Commons; The Bent Coin, fifth level, Robertson Hall

In addition, "all-you-care-to-eat" lunch and dinner is available in the Residence Dining Halls, third level Residence Commons for the price of admission. Students with Campus Cash plans are entitled to reduced prices and tax exemption where permitted.

Vending machines provide off-hour service. Students with Campus Cash plans can make cash purchases without using cash from many of these machines.

A variety of "Campus Cash" plans are available to students offering savings on campus food purchases through both discounts and tax exemptions.

"Care Packages" provide an easy means for friends and families to send birthday cakes, exam study snacks, or celebrate other special occasions with a food treat.

The catering division of food services is equipped to provide banquet services, receptions, party trays or beverage service for groups of up to 800 guests.

### **Tour and Conference Centre**

Telephone: 520-5611

Fax: 520-3952

Each year from May to August, the Housing and Food Services Department operates a successful Tour and Conference Centre. Residence facilities accommodate up to 1,400 guests. A wide range of services including accommodation, catering, meeting rooms, lecture theatres, all at very reasonable rates, are available to conferences and tour groups.

Accommodation is also available to short-term summer visitors from the single traveler staying only one night to students and their families who wish to attend or participate in such University functions as Convocation and first-year student Welcome programs. Long term summer residence (four to sixteen weeks) can be reserved in conjunction with one of four available meal plans.

Arrangements for special functions such as wedding receptions, banquets, parties (large and small) and meetings or other special events are also co-ordinated by the Tour and Conference Centre. Such events may be booked throughout the year.

For further information please contact the Tour and Conference Centre.

## **Library**

MacOdrum Library

Telephone: 520-5621 (hours recording)

520-2735 (Reference and Information)

Fax: 520-2750

Website: [www.library.carleton.ca/](http://www.library.carleton.ca/)

Email: [university\\_librarian@carleton.ca](mailto:university_librarian@carleton.ca)

### **Senior Staff**

*University Librarian*

Martin Foss

*Associate Librarian*

Linda Rossman

*Assistant Librarian (Systems)*

Leslie Firth

*Department Heads*

Gail Catley (Acquisitions)

Bozena Clarke (Access Services)

Alison Hall (Cataloguing)

Anita Hui (Collections)

Susan Jackson (Maps, Data, and Government Information)

Callista Kelly (Interlibrary Loans)

Elizabeth Knight (Reference Services)

Dorothy Rogers (Gifts)

### **Collection**

The University Library, located on the south-west side of the main quadrangle, provides access to a wide variety of materials in support of teaching, learning, and research activity at Carleton. The collection includes more than three million books, periodicals, government documents, maps, newspapers, music scores, compact discs, microforms, archives and rare books. To locate material in the system, you must consult CUBE, the Library's online catalogue: Access to electronic resources is provided through CD-ROM databases and the Internet. Increasingly, more materials are acquired through commercial document delivery services.

### **Borrower Information**

Books may be borrowed at the Circulation Desk or by using the self-check machine located on the Main floor of the Library. You must have a validated ID card with a barcode or Patron Number in order to borrow. Users of the self-check machine must also know their Personal Access Code. Items, with the exception of reserve materials, circulate for two weeks to undergraduate students, and for four weeks to fourth year honours students, graduate students, faculty and staff. On payment of an appropriate fee, alumni of Carleton University and the general public may purchase an outside borrower's card which entitles the holder to limited borrowing privileges.

The Library participates in the Ontario Council of University Libraries (OCUL) Resource Sharing Agreement. This permits all students, faculty, and staff with a valid Carleton ID card, to register at participating Ontario libraries in order to borrow material directly. The Library also participates in IUBP (Inter-University Borrowing Program), which allows Carleton students to borrow from Quebec universities. The Council of Prairie and Pacific University Libraries

(COPPUL) has expanded its "Reciprocal Loan Program" to include the nineteen universities in the Ontario Council of University Libraries (OCUL). Borrowing privileges are now available to all faculty, graduate students, and staff of COPPUL and OCUL member institutions. The Center for Research Libraries offers students access to its material through the Interlibrary Loans Department. As part of a reciprocal borrowing agreement with the University of Ottawa, students, faculty, and staff of Carleton University are given limited borrowing privileges at the University of Ottawa Libraries.

### Regulations

The Library is governed by Senate-approved regulations. The collection is protected against theft by an electronic book detection system. If requested, Library borrowers must submit books, briefcases, and bags for inspection at the Stacks Services Desk. Late return fines and billing costs are charged for overdue books. Borrowers with three overdue books will have their privileges automatically suspended until all items are returned. Examination grades and transcripts will be withheld from students who owe money to the University.

### Specialized Collections

#### *CBC Newsworld*

The CBC Newsworld Collection is an archival and research collection of videotaped programs housed in Room 402.

#### *Special Collections and Archives*

Some print and manuscript materials, because of the content, format, age or value, must be preserved and kept apart from the general collection. This material, as well as the Carleton University Historical Collection and the Library Archives, is housed in Room 503.

### Maps, Data, and Government Information Centre

#### *Maps*

The Map collection consists of topographic and thematic sheet maps, print and digital atlases, local region coverage in air photos and digital orthophotos, and geospatial data files for use with cartographic software.

#### *Data Centre*

The Data Centre Collection comprises microdata files and survey data, including extensive data from Statistics Canada and the Interuniversity Consortium for Political and Social Research.

#### *Government Documents*

The Documents collection includes print, microform, and digital publications issued by governments and intergovernmental international organizations. Through the library catalogue and web pages maintained by MADGIC, extensive links are provided to government

resources available on the Internet.

### Specialized Services

#### *Interlibrary Loans*

If the Library does not have the materials you need, you may request that they be borrowed from another library. Books are usually loaned free of charge; charges may apply for periodical articles provided through conventional I.L.L. or through commercial document delivery services.

#### *Joy Maclaren Adaptive Technology Centre*

The Adaptive Technology Centre, located in Room 232, is equipped with adaptive equipment for use by students with disabilities who are registered with the Paul Menton Centre. Wheelchair accessible CUBE terminals, equipped with large monitors, are available through the Library.

#### *Library Instruction*

General tours, CUBE instruction, specialized course seminars and workshops are offered by staff from Reference Services and the Maps, Data, and Government Information Centre. The Library maintains a computer-equipped training centre in Room 102 for instruction in the use of CUBE and other electronic information resources.

#### *Research Assistance*

Reference Services staff will assist clients in finding library materials, researching essay topics, and identifying the best resources to consult for information needs.

### Ombuds Services

511 University Centre

Telephone: 520-6617

Jim Kennelly

University Ombudsperson

Ombuds Services deals with a variety of grievances and complaints as well as with requests for information. A few examples of the on-campus and off-campus problems include academic appeals, graduation appeals, fee disputes and tenant issues. Financing of this service is provided equally by the University and the Students' Association (CUSA).

### Paul Menton Centre for Students with Disabilities

500 University Centre

Telephone: 520-6608

TDD: 520-3937

Fax: 520-3995

Email: [pmc@carleton.ca](mailto:pmc@carleton.ca)

Website: [www.carleton.ca/pmc](http://www.carleton.ca/pmc)

Larry McCloskey - Associate Director, Student Life Services, responsible for the Paul Menton Centre

Nancy McIntyre - Learning Specialist /  
Co-ordinator, Learning Disabilities

Diane Proulx - Learning Specialist /  
Co-ordinator, Physical Disability Programs

Matthew Cole - Co-ordinator, Attendant  
Services

### **Academic Accommodation**

Carleton University has a Senate-approved policy on Academic Accommodation (see p.54). This policy promotes efforts to accommodate students with disabilities so that they will have the opportunity to meet learning objectives and be fairly evaluated in their performance. The University is strongly committed to providing access and accommodation for all individuals with identified and duly assessed disabilities. In no case, however, does academic accommodation negotiate away, lower or remove the academic standards and learning objectives of any course or program at the University.

### **Publications**

A series of brochures and flyers on resources and services available to students with disabilities at Carleton University may be obtained from the Paul Menton Centre free of charge. Information is also available on the website.

### **Requests for Service**

The Paul Menton Centre provides individualized support services, based on appropriate and up to date documentation, to persons who are deaf or hard of hearing, with learning disabilities, attention deficit disorder (ADD), visual impairments, head injuries, physical disabilities including mobility impairments, or who have psychiatric or other medical disabilities.

Students are responsible for applying for special services by making an appointment with the appropriate coordinator. All requests will be considered on an individual needs basis. Students are advised to come to the Centre early in the term to discuss service requests.

### **Examination Accommodations**

Examination accommodations for all tests and examinations (in-class, itv, or formally scheduled) must be arranged by specific deadline dates. Please refer to the Paul Menton Centre for a list of deadlines for all examinations. Accommodation requests not made prior to the specified deadlines will not be fulfilled.

### **Library Services for Students with Disabilities**

Students referred by the Paul Menton Centre have access to the Joy Maclaren Adaptive Technology Centre, located on the main floor of the MacOdrum Library, Room 232. Heather Cross, Coordinator of Library Services for Students with Disabilities, is located in the department of Reference Services, Room 206 (520-2600, extension 8186). Students are advised to con-

tact her for a complete list of services available in the Library including use of the Centre, research assistance, stacks retrieval, assistance with photocopying, and reserves assistance. Services at the University of Ottawa for students with disabilities are also available to Carleton students. Students must obtain a letter of referral from Heather Cross for each academic year to have access to services at the University of Ottawa.

The Joy Maclaren Adaptive Technology Centre has six workstations on which students have access to various software applications (word processing and spreadsheets), SS-Labs, CUBE, Chat Accounts, Internet Access, the Campus Network, large screen monitors, adjustable-height computer tables, a voice recognition system, screen magnification, screen reading and a scanner.

The Library's contact for alternate format material is Margaret McLeod of the department of Reference Services (520-2600, extension 8943). It is essential to obtain course outlines as early as possible, and to get your requests in early.

Students may scan text using the Reading Edge, a reading machine, and have the scanned material recorded onto audio tape or downloaded onto a disk. This machine is housed in the Joy Maclaren Adaptive Technology Centre.

### **Assistive Technical Devices**

A limited number of note-taking keyboards, two and four-track tape recorders, and personal FM systems are available for loan. Written referral by a Paul Menton Centre Coordinator is required.

### **Students who are Deaf or Hard of Hearing**

It is the student's responsibility to initiate early enquiries. If specialized equipment or services, such as personal FM systems or sign language interpreters, are required, please contact the Centre at least a month prior to the start of classes.

### **Students with Learning Disabilities**

It is required that the student have a recent psychoeducational assessment available which has been administered after the age of 16 or within three years of initial registration at the Paul Menton Centre. This will allow Paul Menton Centre staff to organize services that address each individual's particular learning disability.

### **Students with Attention Deficit Disorder (ADD)**

To receive accommodation, students with ADD are required to have formal identification from a psychiatrist, psychologist or physician. For further information contact the Paul Menton Centre.

### Students with Mobility Impairments

The campus of Carleton University is well equipped for accommodating persons with physical disabilities. The buildings are in close proximity to each other and most are connected by tunnels. All of the main buildings have elevators and are ramped for outside entrance and egress. Most sidewalks have been made accessible by curb-cut renovations. A building-by-building accessibility inventory is available from the Centre or on the website.

### Students with Non-Visible Disabilities

Students with non-visible disabilities may have legitimate needs which are not easily recognized or understood within the University community. Students with psychiatric or medical disabilities may wish to contact the Paul Menton Centre to discuss issues of concern to them. Appropriate documentation is required.

### Attendant Services Program in Residence for Students with Disabilities

The Attendant Services Program in Residence offers 24 hour assistance with activities of daily living such as personal care, room chores, cafeteria assistance, etc. The program is available to students with various levels of disability and attempts to respond to individuals according to their specific needs. In order to provide comprehensive services only a limited number of program spaces are available each year. A guide describing the program in detail is available free of charge by contacting the Attendant Services Co-ordinator at 520-6615.

For students who need an accessible room in residence but do not require attendant services, a limited number of rooms are available based on the following criteria: the need for special accommodation, level of disability, whether the applicant has housing alternatives in the area, and the date of application. For further information contact the Accommodations Officer in the Department of Housing and Food Services at 520-5612.

### Student Life Services

501 University Centre  
Telephone: 520-6600  
TDD: 520-3937  
Fax: 520-3995  
Email: [studentlife@carleton.ca](mailto:studentlife@carleton.ca)  
Website: [www.carleton.ca/studentlife](http://www.carleton.ca/studentlife)

Student Life Services offers a wide range of programs and services to assist students in their adjustment to academic life, in improving their learning strategies, and in making decisions with regard to academic and career concerns. Four units comprise Student Life Services. They are Campus Life Program, Career Services (see p. 16), International Student Advisory, and the Paul Menton Centre for Students with Disabilities (see p. 23).

### Campus Life Program

The goals of campus life programming are to assist new students in a variety of areas (e.g., academic, social, emotional, leadership) thereby easing the transition to life at Carleton University. In addition to orientation activities, a range of services and programs are offered throughout the year to assist students with the adjustments to university, academic success, and with preparation for life after graduation. The Campus Life Coordinator is also available to discuss student concerns specific to graduate students.

### Study Skills Program

The Study Skills Program is designed to assist both undergraduate and graduate students. A series of workshops, which begin in early September, cover topics such as Active Reading, Essay Writing, Oral Presentations, Thesis Writing, as well as general Study Skills workshops covering Note-taking, Time Management and Exam Preparation. These are offered in small groups to accommodate discussion and interaction, and participants have access to individual follow-up if needed. Drop by to register for the workshops.

For individual assistance in a specific area (e.g., coping with graduate studies), see a Study Skills Specialist during drop-in hours. Free brochures on topics such as Time Management, Active Reading, Note-taking, Exam Preparation, and Study Skills for its students are available. A variety of study skills videotapes are also available through Video and Film Services (D299 Loeb).

### International Student Advisory

The International Student Advisor is available to discuss particular concerns international students may have. An orientation program is held every September and January for incoming international students. Information and assistance concerning university education, financial assistance, UHIP health coverage, immigration regulations, and the general adjustment to a new living situation are available. Please call for drop-in and appointment times.

### University Centre

The University Centre (Unicentre) is a non-academic, student-oriented building which serves as the hub of the campus. It is home to the Carleton University Students' Association and virtually all of its operations (i.e. coffeehouse, pub, convenience store). Its location and atmosphere makes it the perfect meeting place and an ideal setting for events of interest to all students.

In addition to housing CUSA services, the Unicentre is home to: Student Life Services, Information Carleton, Ombuds Services, the Graduate Students' Association, a division of the Ontario Public Information Research Group,

and the Paul Menton Centre. Porter Hall, which is available for both on- and off-campus groups to rent, is also located within the Unicentre.

For a more complete list of the services available, please see the section entitled Carleton University Students' Association. (See p.17)

## **Writing Tutorial Service**

The Writing Tutorial Service offers individual and small group tutorials to students who want advice on the writing of university essays. The tutors provide practical instruction on all aspects of the writing process from the initial research and data-gathering, to the exploration and organization of ideas, through to the final preparation of the manuscript. In addition, the service regularly presents workshops on style and the general principles of essay writing at the request of Faculty and/or Teaching Assistants. The service is offered free of charge to all Carleton students, part-time and full-time, graduate and undergraduate. For an appointment or information, call 520-6632 or visit 215 Paterson Hall from 8:30 a.m. to 4:30 p.m., Monday to Friday.

## Alumni Association

510 Robertson Hall  
 Telephone: (613) 520-3636  
 Fax: (613) 520-3587  
 Email: [devalum@carleton.ca](mailto:devalum@carleton.ca)  
 Website: [www.carleton.ca/alumni](http://www.carleton.ca/alumni)

The Carleton University Alumni Association represents the over 84,000 graduates of Carleton University. Membership is automatically extended to all graduates, and is available, upon request, to former students who have completed 5.0 credits but are no longer registered at Carleton.

The objectives of the association are to advance the excellence and prestige of Carleton University as a distinguished institution of higher learning in Canada, and to encourage a spirit of loyalty, friendship, service and benevolence among the members.

The alumni association serves the University by promoting its well-being through contact with graduates, government, the public, faculty, students and potential students. Its members are actively involved in various advisory boards, and as ambassadors for Carleton. It is governed by the Executive Council, a volunteer group. The Alumni Association is represented by 13 branches across Canada, affiliates internationally and 18 chapters.

The Department of Development and Alumni Services maintains alumni records to ensure a meaningful dialogue between alumni and the University. All graduates with known addresses receive various correspondence from the University including the **Carleton University Magazine** three times per year, news on events and activities such as Homecoming, and fundraising appeals.

In addition, the University partners with a few select businesses to promote a variety of affinity services to alumni. These services are arranged with the support of the Carleton University Alumni Association and offer members a range of benefits, including an alumni affinity card, life, home and auto insurance, extended health, dental care, financial services, apparel and discounts at the Library, University Club, Tour and Conference Centre, Bookstore and Athletics. Should alumni wish not to receive affinity mailings they may opt out by informing the department of Development and Alumni Services at [devalum@carleton.ca](mailto:devalum@carleton.ca) or by phone 1-800-461-8972. Funds raised from alumni participation in affinity services help to support student awards and other alumni initiatives such as Alumni Park and the Alumni Wall of Fame.

The alumni association sponsors Homecoming, reunions, an alumni awards program including Graduate and Undergraduate Student of the Year Awards, and various chapter and branch activities. Currently alumni are registering in PATRON (Putting Alumni Talent and Resources ONline) to volunteer for a number of activities that support Carleton University and its students, including a mentoring program.

Executive Council of the Carleton University Alumni Association for 2000-2001 are:

Jennifer Higgins-Ingham, BA/89, BAHons/92, *President*  
 Gerard Buss, BA/73, *Vice-President, Branches*  
 Jane Gilbert, BJ/80, *Vice-President, Chapters*  
 Michael Makin, BJ/86, *Past-President*  
 Jeff Polowin, BA/69, *National Capital Branch President*  
 Brian Ford, MCS/80, *Senate Representative*  
 Sean O'Neill, MMS/99, *Athletic Board Representative*  
 Reena Bhatt, BComm/91, *Chair, Homecoming*  
 Giuliano Toluoso, BJ/83, *Chair, Editorial Advisory Committee*

The year 2001 is an election year for the Carleton University Alumni Association and some members of the above executive may change. For an updated list please go to [www.carleton.ca/alumni](http://www.carleton.ca/alumni) and click on Your Association.

## **Inventions, Technology Transfer, Intellectual Property and the Graduate Student**

Technology and Research Development Office  
1524 Dunton tower  
Telephone: 520-2517  
Fax: 520-2521

In the course of their research activities, graduate students at Carleton University sometimes make discoveries that have commercial potential. There is a process that enables inventors at Carleton University to seek protection for their ideas and to enter partnerships to seek commercial possibilities.

As soon as preliminary research results exist or when outsiders have expressed interest in your research area or technology, graduate students should contact the Technology and Research Development Office. This office identifies, evaluates, and protects the inventions and technologies developed on campus. It also assists in the transfer of these technologies to the private sector. If you have any questions intellectual property, patents, confidentiality agreements, etc., please contact the Technology and Research Development Office or visit their webpage at [www.gs.carleton.ca/trdo](http://www.gs.carleton.ca/trdo).

## **Student Participation in Academic Affairs**

There are several ways in which students may become involved in academic issues on campus.

Students may join the New University Government (NUG). NUG is an organization which gives students direct input into academic decisions by filling the student representative positions at departmental meetings. As a result of such representation, students have direct input into curriculum committees and hiring boards, as well as routine departmental issues. Each department has at least one graduate NUG representative. Departmental NUG representatives also sit on their (specific/respective) Faculty Boards. Each faculty is entitled to send two representatives to the Graduate Faculty Board, and two of these student representatives are elected to the University Senate where most of the general academic decisions are made.

There are several Senate policy committees which have graduate student representation. These include the Library, Computer, Admission and Studies, University Government, and the Academic Planning committees. There are other Senate committees, but do date they do not have spaces reserved specifically for graduate students.

Finally, there is the GSA council, where representatives from every department meet not only to discuss academic issues but to formulate GSA policies on academic matters, which may be presented to Senate or other University committees.

To obtain more information on any of these, please call the GSA at 520-6616, or drop by the office, 600 Unicentre.

## Carleton International

K.J. McGillivray  
Director

Dunton Tower 1506  
Telephone: 520-2519  
Fax: 520-2521  
Website: [www.ci.carleton.ca](http://www.ci.carleton.ca)

Carleton International co-ordinates the University's efforts in international activities. Carleton has many formal academic linkages with other countries. These are administered on behalf of the University by Carleton International, and many allow graduate students to spend a term or a year abroad in study relating to their research. Information and applications to participate in an exchange as well as information on scholarships and study/work opportunities abroad are available through Carleton International. Application is usually made in October/November.

Carleton International is also responsible for the negotiation, management and administration of international grants and contracts, liaison with the international and diplomatic community and for the reception of foreign visitors and delegations to the University.

## Study Abroad

Carleton has many formal academic linkages with other countries. These are administered on behalf of the University by Carleton International. Students have the opportunity to spend a term or a year abroad in such countries as Australia, Austria, Cuba, England, Germany, France, Hungary, Jordan, Japan, Mexico, Poland, Russia, Tanzania, and Scotland. Application forms and scholarship information for study abroad are available through Carleton International, Room 1506, Dunton Tower, telephone 520-2519. Application deadline is usually late November.

## Fees

### Tuition Fees and Charges 2001-2002

Tuition fees, late charges, and other fees and charges are reviewed in the spring of each year. At the time of printing, tuition fees and charges for 2001-2002 were not yet decided upon.

Once fees and charges have been set, specific details will be published on Carleton's Website by May 1 ([www.carleton.ca/fees/](http://www.carleton.ca/fees/)) and in the *Registration Instructions and Class Schedule* booklet which is made available to all incoming and returning students during the month of July. Students are advised to familiarize themselves with this information.

### Dates Relating to Fees and Charges

Dates relating to tuition fee payments, cancellations of course selections, late charges, and other fees or charges are published in the Important Dates and Deadlines section of the 2001-2002 *Registration Instructions and Class Schedule* booklet.

# Awards and Financial Assistance

## General Information

### Medals

- \* The Governor General's Medal, Graduate Level

Awarded annually to a graduating student of very high academic standing in a master's or doctoral program of study. Donor: His Excellency the Governor General of Canada. Established in 1988.

- \* University Medal at the Ph.D. Level

Awarded at each convocation ceremony, when merited, to a graduating student for outstanding academic achievement at the Ph.D. level. Established in 1982.

- \* University Medal at the Master's Level

Awarded at each convocation ceremony, when merited, to a graduating student for outstanding academic achievement at the master's level. Established in 1982.

## Awards Policy

In recent years Carleton graduate students have won a large number of external scholarships such as SSHRC fellowships, NSERC scholarships, and Ontario Graduate Scholarships, and Ontario Graduate Scholarships in Science. In addition, the University itself provides generous support, and the majority of graduate students receive funds from this source.

Students who hold such awards must pay regular tuition fees unless otherwise stated.

Full-time graduate students at Carleton University are expected to comply with the following procedure. Any full-time graduate student who accepts an award that is not directly administered by Carleton University must immediately inform his/her departmental chair and the Dean of the Faculty of Graduate Studies and Research in writing. This requirement applies to any awards or assistance offered by any agency or institution.

## Application Deadlines

March 1 is the last date for receipt of completed applications for admission (including transcripts, letters of reference, etc.) from candidates who wish to be considered for the initial award, announced April 1, of financial assistance administered by Carleton University. However, some departments have earlier application deadlines and students are strongly advised to check with the individual department concerned.

Candidates whose applications are received after the March 1 deadline may be eligible for the award of a scholarship and assistantship by reversion.

## Method of Payment

All awards administered by Carleton University will be paid on a monthly basis, with the first installment on September 30.

*Students are urged to note the above payment dates and be prepared to be financially self-sufficient during the month of September.*

## Other Awards

A number of national and provincial organizations award fellowships and scholarships are tenable at Carleton University such as SSHRC, OGS, NSERC, OGSST, etc.). Some application procedures and regulations concerning fellowships awarded by agencies other than Carleton University are given in the description of each of these awards.

In addition, a large number of foundations, companies, fraternal organizations, and other agencies offer fellowships and scholarships. Information on these funding opportunities, agency deadlines, and application procedures is available on the Faculty of Graduate Studies and Research website at [www.gs.carleton.ca](http://www.gs.carleton.ca).

## Eligibility

In the case of fellowships, grants, scholarships, etc., for which students must make application, it is the individual student's responsibility to establish his/her eligibility. Should it become known that a student is unqualified for any reason, he/she must return the funds already received, with the University assuming no responsibility.

Departments recommending students for internal awards must accept full responsibility for the eligibility of their nominees.

Students are urged to consult carefully the brochures and announcements which specify the conditions associated with tenure of individual awards.

This information is available in the office of the Faculty of Graduate Studies and Research and in departmental offices.

## Awards Administered by Carleton University

The awards administered by Carleton University are derived from a variety of sources. Throughout the years, a number of individuals and organizations have contributed substantial

funds to the University, through bequests and donations, in order to help support students in various fields of study.

These sums, together with the assistantship funds made available from the University budget, make up the reservoir from which the Carleton scholarships and assistantships are drawn.

It is not always possible to identify precisely the sources of various donations and bequests (often small, but most important in the aggregate) from which any graduate student's financial support has been constructed. In the following cases, however, either because of the relative importance of the contribution or because of the fact that it is earmarked for a specific type of student or program, we do identify the external source from which the award has originated.

### **Dick Abbott Memorial Bursary**

Awarded annually to a graduate student in the School of Public Administration who is in need of financial assistance. Endowed in 1997 by the faculty and staff of the School of Public Administration in memory of Dick Abbott, a distinguished and long-serving member of the faculty. The recipient will be chosen each year on the recommendation of the Director of the School of Public Administration.

### **The Patricia Allen Scholarship**

This scholarship was established in 1991 in response to the tragic crossbow killing of Patricia Allen. Valued at \$2,000, the scholarship will provide funds to assist graduate students working in the areas related to spousal violence. Relevant research topics are those which explore why this violence exists and persists, as well as identifying the forces which give rise to conflicts leading to violence in a spousal relationship. Such forces may be biological, psychological, sociological, or cultural in nature, or any combination of these.

Application should be made on the prescribed forms to the Faculty of Graduate Studies and Research. Deadline for application – October 15. The recipient will be selected each year by the Members of the Board of the Patricia Allen Foundation. Competition is open to Carleton University and York University students.

### **Carl Amberg Fund for International Students**

To be awarded annually, on the recommendation of the Dean of Graduate Studies and Research, to an international graduate student in financial need. Endowed in 1997 by Carl Amberg, a former Dean of Graduate Studies and Research whose distinguished career at

Carleton was cut short by a sudden stroke in 1980.

### **Duncan M. Anderson Memorial Bursary**

This bursary was endowed in 1992 by colleagues, former students, and friends of Duncan M. Anderson, who was a professor in the Department of Geography from 1964 to 1992. It is awarded annually to a deserving full-time student enrolled in the graduate program in geography who is in need of financial assistance, and whose studies relate to land use planning, resource management, or geographic aspects of the environment.

Application is not required. The recipient will be announced by the Dean of the Faculty of Graduate Studies and Research, on the recommendation of the Chair of the Department of Geography.

### **The John W. ApSimon Graduate Student Award in Chemistry and Biochemistry**

Awarded annually to a graduate student or students under the supervision of members of the Department of Chemistry or the Institute of Biochemistry, who is/are in need of financial assistance to present thesis-related papers at an international conference. The award will be announced by the Dean of Graduate Studies and Research upon the recommendation of the Chair of the Department of Chemistry. Endowed 2000. Donors: Friends, family and colleagues of Dr. John W. ApSimon, former Vice-President (Research and External) and Professor of Chemistry at Carleton University, to recognize his 38 years of contribution to the university and the broader community.

### **Friends of Art History Book Award**

Endowed in 1994 by the Friends of Art History, this award, valued at \$100, is presented annually to a graduate student enrolled in the Master of Arts program in Canadian Art History. Application is not required. The recipient will be chosen on the recommendation of the Art History Graduate Committee.

### **The Association of Palestinian Arab Canadians Graduate Scholarship**

This scholarship was established in 1988. It is awarded annually to an outstanding recent graduate of the following Palestinian universities: Bier Zeit, Al-Najah National, Al-Khaleel (Hebron), Bethlehem, The Islamic University of Gaza and Al-Quds (Jerusalem).

The recipient will be chosen by an awards committee chaired by the Dean of the Faculty of Graduate Studies and Research from nomina-

tions made by the students' home institutions. It is hoped that the recipient will return to a teaching position in a Palestinian University.

### **Auto-Carto Six Scholarship**

This scholarship is awarded annually to a graduate student in geography studying computer-assisted cartography. The scholarship will be awarded, on the recommendation of the Department of Geography, on the basis of academic merit as determined by the academic index used by the Faculty of Graduate Studies and Research.

### **The Baha'i Community of Canada Bursary for International Students**

Established in 2000 by the Baha'i Community of Canada in memory of Mr. Farid Behmardi, this bursary is to assist an international student, registered full-time in a graduate program, who has completed his or her undergraduate degree in the face of adversity and who is in need of financial assistance in order to be able to continue his or her graduate studies.

### **Walter Baker Fellowship**

In honour of the distinguished contribution of the late Walter Baker to Canadian politics, parliamentary life, and public administration, and his long-standing dedication and service to the Ottawa community, Minto Construction Ltd. has established the Walter Baker Fellowship. It is awarded annually to an outstanding student entering the School of Canadian Studies M.A. program. Application is not required; the recipient will be chosen by the graduate awards committee from a list of candidates recommended by the Director of the School of Canadian Studies.

### **Fred Barkley Special Bursary**

This bursary, in the amount of \$500, is awarded annually to a graduate student from a developing country who requires special financial assistance in order to study at Carleton University. The recipient of the award will be announced by the Dean of the Faculty of Graduate Studies and Research each year.

### **Harold Bernstein Memorial Award in Physical Chemistry**

This grant, valued at approximately \$1,000, will be awarded annually to a student joining the graduate program of the Ottawa-Carleton Institute to study and do research in the area of physical chemistry. It is a one-time scholarship, and is additional to all other stipends or scholarships that the student may hold.

The award is named in honour of Dr. Harold J. Bernstein, eminent spectroscopist and re-

searcher, who retired from the National Research Council, Ottawa, in 1979. Dr. Bernstein served as an adjunct professor of chemistry at Carleton University from 1970 to 1979.

### **Dr. Thomas Betz Memorial Award**

Established in 1990 by family, friends, and colleagues in memory of Dr. Thomas Betz, this award, valued at \$1,000, is open to undergraduate and graduate students and is awarded annually, when merited, on the basis of scholarly promise and potential for intellectual leadership. The candidate must have a strong vision of what he/she wants to achieve in life and must be developing or have developed, a multi-disciplinary approach in order to achieve this goal. The recipient will be chosen on the recommendation of a selection committee chaired by the Dean of the Faculty of Graduate Studies and Research, from a list of candidates nominated by departments, schools, and institutions.

### **Board of Governors' Graduate Student Bursaries**

Established in 1992 by members and friends of Carleton University's Board of Governors on the occasion of Carleton University's 50th Anniversary, these bursaries are available to graduate students who are Canadian citizens and who need financial assistance to cover tuition fees.

Application should be made to the chair/director of the student's academic unit. The final selections will be made by the Dean of the Faculty of Graduate Studies and Research from a list of names recommended by each academic unit.

### **The Professor B.R. Bociurkiw Prize**

To be awarded annually on the recommendation of the Department of Political Science to the undergraduate or graduate student writing the best essay in the field of Ukrainian Politics or church/state relations in Eastn Europe. The prize was established by friends and colleagues to honour Professor Bociurkiw.

### **The Swithun Bowers Memorial Social Work Bursary**

Endowed in 1985, this bursary is available to graduate students within the School of Social Work who are nearing the completion of their program and experiencing financial difficulty in meeting the costs of typing/reproduction of their thesis or independent enquiry project.

The selection of the recipient(s) will be decided on the recommendation of the Director of the School of Social Work.

### **Peter Browne Memorial Scholarship Fund**

This scholarship was established in 1983 by students, friends, and colleagues of the late Professor G. Peter Browne. The recipient will be chosen by the awards committee upon the recommendation of the Department of History from among those students who apply. Preference will be given to deserving history graduate students who are nearing the completion of their thesis.

### **Building Envelope Council, Ottawa Region, Award**

Valued at \$200 and established in 1995, this award is given annually, on the recommendation of the Chair of the Department of Civil and Environmental Engineering, to a graduating student in an undergraduate or graduate program of study who has demonstrated excellence in the area of building envelopes.

### **Dr. John Davis Burton Award**

Awarded annually, when merited, to a student in good standing enrolled in a program at Carleton University, University of Ottawa, La Cite Collegiale, or Algonquin College who has made a significant contribution toward awareness, equality, and integration of persons with disabilities within his/her educational community. The recipient will be chosen on the recommendation of the Assistant Director (Special Needs), Student Life Services at Carleton University, assisted by a Selection Committee. Endowed in 1992 by students, family, and friends of Dr. John David Burton, who was a champion and advocate for persons with disabilities throughout his career as an educator.

### **CAL Corporation Scholarship**

This scholarship, valued at \$2,500, is provided annually by CAL Corporation in honour and memory of Mr. Bev Christie, Mechanical Group Leader, who was a key employee at CAL Corporation until his untimely passing. It is awarded to a student of outstanding performance studying for a graduate degree in electrical engineering who is working in the field of aerospace electronics with an emphasis on microwave technology, antennas, or radar.

Application is not required. The recipient will be selected on the recommendation of the Scholarship Committee, composed of the chair of the department and one other faculty member. The recipient of the award will be announced in January each year. In a given year, the award may not be made for lack of a suitable candidate, but will be held over so as to allow more than one recipient in a subsequent year.

### **Don Whilton Campbell Memorial Bursary**

An annual bursary, awarded to an M.A. student studying Canadian History who requires financial assistance to cover the costs of research for their thesis in order to complete their studies at Carleton University. The award was established to honour the memory of Don Wilton Campbell, by his daughter Laurie Campbell. Application is not required. The selection of the recipient will be made upon the recommendation of a selection committee comprised of the Department of History Graduate Committee.

### **Canadian Museum of Nature Graduate Fellowship**

Awarded annually to a student or students with high academic standing, registered in a graduate Science program. The recipient must be engaged in research in an area of mutual interest to both the Museum and Carleton. This award is valued at \$10,000 per year for a single student, or, if appropriate, for two graduate students at \$5,000 per year each.

Application takes place in June of each year. The application should include a description of the proposed project and a letter of support from the applicant's supervisor. The selection of the recipient will be decided on the recommendation by the members of the Joint Museum Carleton Committee.

### **The Carleton University Academic Excellence Scholarship for International Students**

Awarded on admission to academically outstanding international students who are entering either a master's or a doctoral program. Valued at \$5,000, payable over twelve months, these scholarships are renewable for two years at the master's level and four years at the doctoral level. The scholarship ceases when the students becomes a Canadian citizen or permanent resident. Recipients are selected by the Dean of Graduate Studies and Research on the recommendation of the departments/institutes/schools.

### **Carleton University Fine Arts Award**

Awarded annually upon the recommendation of the Director of the Carleton University Art Gallery with the advice of the Practicum Coordinator, Art History, School for Studies in Art and Culture to a graduate or undergraduate student registered for the practicum credit and undertaking a curatorial project. Donor: Kenneth and Margaret Torrance and other friends of the Carleton University Art Gallery. Endowed 1999.

## Central/East European and Russian-area Studies Bursary

Awarded annually to one or more deserving graduate or undergraduate students in the Institute of European and Russian Studies who are studying one of the post-communist countries in Central and Eastern Europe or the former Soviet Union. Endowed in 1997 by faculty, staff and friends of the Institute.

This bursary is open only to permanent residents of Ontario, and the recipient will be chosen by the Director of the Institute of European and Russian Studies.

## R.F. Chinnick Memorial Scholarship

This scholarship is provided by Telesat Canada in memory of R.F. Chinnick, their former Vice President of engineering and operations. It is awarded annually, where appropriate, to a student enrolled in a graduate program in electrical engineering who is working in the field of satellite communications, or whose work has direct relevance to this area of telecommunications.

It is normally awarded in the second or subsequent year of graduate work, when the student's area of specialization has been well established. It may be awarded more than once to the same student. If an award is not appropriate in a given year, it will be held over so as to allow more than one recipient in a subsequent year.

## The Irene Ethel Cockburn Bursary

This bursary, which carries a value of up to \$2,000, was established in 1991 and is derived from a legacy of the late Irene Ethel Cockburn. It may be awarded to one or more graduate students who require special financial assistance in order to complete their studies at Carleton University. Application is not required. The recipient(s) will be selected by the Dean of the Faculty of Graduate Studies and Research from a list of candidates recommended by each department.

## Scholarship in Comparative Economics

Awarded annually, if merited, on the recommendation of the Chair of the Department of Economics, to a graduate or undergraduate student who has shown aptitude in the field of comparative economics. Endowed in 1991 by Professor Richard Carson in memory of his parents, Robert L. and LeVerne N. Carson.

## Odette Condemine Graduate Scholarship in French Canadian Literature

Endowed in 1995 by Professor Odette Condemine, who taught French Canadian Lit-

erature at Carleton University until her retirement in 1992, this scholarship is awarded annually, when merited, to the graduate student in the French program who has demonstrated the most promise in French Canadian Literature. Application is not required. The recipient will be announced by the Dean of the Faculty of Graduate Studies and Research on the recommendation of the Chair of the Department of French.

## Helen and Joe Connolly Bursary

To be awarded annually to a deserving graduate student in Canadian history in need of financial assistance. Consideration for the award will be given on the basis of academic achievement combined with an interest in community involvement and extracurricular activities. Endowed in 1997 by Helen and Joe Connolly. The recipient will be selected by the Chair of the Department of History. Department of History Graduate Student Bursary

To be awarded annually to a graduate student in History who is in need of financial assistance. Endowed in 1997 by the faculty, staff and friends of the Department of History. The recipient will be selected by the Chair of the Department of History.

## The Harold Crabtree Foundation - Ontario Graduate Scholarship (OGS)

Established in 2001 by The Harold Crabtree Foundation, this \$5,000 scholarship given over three academic terms is awarded to a student in the Ph.D. program in Canadian Studies who has been awarded an Ontario Graduate Scholarship in the amount of \$10,000 in an academic year. The winner is selected by the Director of the School of Canadian Studies.

## The Dean of Graduate Studies Entrance Scholarship for Academic Excellence

Awarded on admission to domestic students who have demonstrated academic excellence and are entering either a master's or doctoral program. Valued at \$2,000, the scholarship is payable over eight months in the first year of a program of graduate studies. Recipients are selected by the Dean of Graduate Studies and Research on the recommendation of the departments/institutes/schools.

## Director's Book Prize in Canadian Studies

This award, valued at \$100, is presented annually to a graduate student enrolled in the first year of the Master of Arts program in the School of Canadian Studies. Application is not required. The recipient will be chosen by the Director of the School of Canadian Studies.

### **Emmett Dunne Scholarships**

Endowed in 2000 by the estate of Mr. Emmett John Dunne (BA 1956), these scholarships are awarded annually to graduate students in Chemistry. A minimum of two scholarships, each to the value of \$3,000 over one academic year (3 terms), are awarded on the recommendation of the chair of the Department of Chemistry, to graduate students registered in the Department of Chemistry.

The recipients of this scholarship may be eligible for consideration for an Ontario Graduate Scholarship in Science and Technology (OGSST), which, if it were awarded, would raise the scholarship to \$9,000 over three terms. If an OGSST is awarded, the OGSST guidelines will apply to this scholarship.

### **Davidson Dunton Memorial Student Assistance Fund**

Established in 1987 by relatives, colleagues, and friends of the late Davidson Dunton, Carleton's fourth and longest serving President and a Director of the School of Canadian Studies, this fund is available to graduate students within the School of Canadian Studies who are experiencing financial difficulty meeting the costs of typing/reproduction of their thesis or other research papers, attendance at conferences, or other approved special needs.

The selection of the recipient(s) will be made upon the recommendation of the Director of the School of Canadian Studies.

### **Rachael Elizabeth Edwards Memorial Award**

Awarded annually, on the recommendation of the School of Journalism and Communication, to an outstanding student completing the first year of the Master of Journalism program. Preference will be given to a female student who has indicated an interest in pursuing a career in the daily newspaper field.

Endowed in 1974 in memory of Rachael Elizabeth Edwards, a former student in the School of Journalism and Communication. Revised in 1987.

### **The Hendrika Alice Eisen Memorial Fund**

This fund was established in 1990 by friends, co-workers, and relatives of the late Hendrika Alice Eisen, a graduate student in the Department of Psychology who was working in the interdisciplinary area of computer interface design.

In memory of the interdisciplinary nature of her interests and the high regard she had for the annual conference in computer-human inter-

actions (CHI) presented by the Special Interest Group SIGCHI of the Association of Computing Machinery, this fund is to assist graduate students interested in attending this annual conference. Application for assistance with travel or accommodations can be made to the office of the Faculty of Graduate Studies and Research. Preference will be given to students presenting posters or papers at CHI and who are acting as student volunteers at the conference. The award is open to students from any discipline who are interested in attending the CHI conference.

### **The David and Rachel Epstein Foundation Fellowship: Equal Pay for Work of Equal Value**

Established in 1985, this fellowship is open to students studying in any discipline within the social sciences or humanities to support a master's or doctoral student in a thesis program. The thesis should be on the topic of "equal pay for work of equal value", and should have a strong empirical basis with application to Canadian work settings.

Valued at \$6,000, this fellowship is provided by part of the income from the David and Rachel Epstein Fund. It will be awarded on the basis of academic merit as determined by the Faculty of Graduate Studies and Research from a selection of applicants who have submitted a research proposal related to the above. Departments will be asked by the selection committee to nominate suitable candidates. In a given year, the award may not be made for lack of a suitable candidate.

### **David and Rachel Epstein Foundation Scholarships**

Part of the income from the David and Rachel Epstein Foundation Fund, which was established in 1970, has been designated to provide scholarships for outstanding graduate students at Carleton University.

Up to twenty scholarships valued at \$1,000 will be awarded annually to students from a list of candidates recommended by each department. Application is not required.

### **Fluorescence Inc. Scholarship in Chemistry**

Two scholarships, each to the value of \$3,000 over one academic year (three terms), are awarded annually, on the recommendation of the Chair of the Department of Chemistry, to graduate students specializing in inorganic or materials chemistry.

Endowed in 1999 by the founder of Fluorescence Inc., a company that specializes in custom instrumentation. The recipients of this scholar-

ship may be eligible for consideration for an Ontario Graduate Scholarship in Science and Technology (OGSST), which, if it were awarded, would raise the scholarship to \$9,000 over three terms. If an OGSST is awarded, the OGSST guidelines will apply to this scholarship.

### **Harriet and Eugene Forsey Scholarship**

This scholarship was established in 1993 by the Canadian Federation of University Women/Ottawa in memory of the mutual fidelity of the Forseys. Senator Eugene Forsey was a recognized expert on the Canadian Constitution and a lecturer in Carleton's Political Science Department for many years.

Valued at \$1000, this scholarship is awarded annually, when merited, to a graduate student in the Political Science program who is working in the area of the Canadian Constitution. Application is not required. The recipient will be announced by the Dean of the Faculty of Graduate Studies and Research, on the recommendation of the Chair of the Department of Political Science.

### **GAC-MAC Graduate Scholarship in Earth Sciences**

This scholarship was endowed by the Geological Association of Canada and the Mineralogical Association of Canada in recognition of the support provided by the Ottawa-Carleton Geoscience Centre when Carleton University hosted the "Ottawa 86" Annual GAC-MAC Meeting.

It will be awarded annually to a graduate student enrolled in the Ottawa-Carleton Geoscience Centre. Application is not required. The recipient will be selected by the Board of Management of the Ottawa-Carleton Geoscience Centre.

### **Indira Gandhi Memorial Fellowship**

This fellowship, to the value of approximately \$10,000, was established in 1985 by friends of India to honour the memory of Mrs. Indira Gandhi, Prime Minister of India, 1966-1977 and 1980-1984.

It is awarded annually to an outstanding (preferably foreign) student enrolled in a graduate program. No application is required for this fellowship. The recipient will be chosen by an awards committee chaired by the Dean of the Faculty of Graduate Studies and Research from candidates recommended by departments, schools, and institutes having graduate programs.

### **The Michel Gaulin Travelling Bursary in the Humanities**

The purpose of this bursary is to assist in defraying the costs of research-related travel for a graduate student in the humanities (languages and literatures, linguistics, history, philosophy, religion, art and culture, and Canadian Studies). The criteria for the award are academic excellence and a clear statement of the benefits for the student's research of the proposed travel. The bursary will be awarded by the Dean of Graduate Studies and Research upon the recommendation by the Department. Donated by Dr. Michel Gaulin, a former Professor of French and Clerk of Senate at the University.

### **Randall Geehan Memorial Scholarship in Quantitative Economics**

Awarded annually, on the recommendation of the Chair of the Department of Economics, to a deserving fourth-year honours student or graduate student whose studies emphasize quantitative work in economics. Endowed in 1990 by colleagues, family, and friends in memory of Dr. Randall Geehan, who was a professor in the Department of Economics.

### **Murray Goldblatt Master of Journalism Scholarship**

Awarded annually, in the amount of \$500, on the recommendation of the Director of the School of Journalism and Communication, to a student proceeding from first to second year in the Master of Journalism program, who shows the best potential as a journalist. Funded by a bequest from the estate of Murray Goldblatt, who shared his experience and passion for the media as a professor at Carleton for 19 years.

### **Lois Gonyer Bursary**

Awarded annually, on application and on the recommendation of the Director of the School of Canadian Studies, to a Canadian Studies graduate student whose program is threatened because of financial need. Established in 1988 by friends and colleagues of Lois Gonyer and funded by them and institute graduates in recognition of her twenty-seven years of service as administrator in the School of Canadian Studies.

### **Graduate Scholarship in Civil Engineering**

This award is made possible by contributions from staff and faculty employees in Civil Engineering as well as from other donors. The award, valued at up to \$500, will be provided annually to an outstanding undergraduate student at Carleton who enrolls in a graduate program in

the Department of Civil and Environmental Engineering. No application is required. The recipient will be selected by a scholarship committee composed of the Chair of the Department of Civil and Environmental Engineering, the departmental supervisor of graduate studies, and two other faculty members from the Department of Civil Engineering.

### **Graduate Student Research Fund**

Application is made by letter from the graduate student to the Dean of the Faculty of Graduate Studies and Research and must include a letter of support from the supervisor. The letter should contain a brief description of the research project underway, provide a research plan outlining the need for requested funds, and include a full budget. The student must be registered in the thesis or major research project in the term in which funding is requested. There is no deadline date.

The Fund is intended to cover modest research where other sources of support are not available. Eligible costs include translation, mailing, field travel, supplies, long-distance telephone charges and questionnaire production. Costs associated with interview subjects, honoraria or related expenses are not eligible. While the cost of copying the thesis itself is not eligible, the cost of copying journal articles in a library or archive is an eligible research expense under the terms of the fund.

The maximum amount awarded is \$500 per research/thesis project.

### **Graduate Student Travel Funding Policy**

The Faculty of Graduate Studies and Research provides some funding assistance to full-time graduate students who are presenting papers at scholarly conferences. Awards usually amounting to one-quarter of transportation costs are made with the expectation that, where possible, similar contributions will be made by one or more of the parent department or school, the faculty dean, the research supervisor, and the student.

Application forms available in the office of Graduate Studies, must be submitted at least six weeks in advance of the proposed travel, to the Dean of the Faculty of Graduate Studies and Research. The application should include the name and location of the conference, the dates of attendance, and a full budget. A letter of support from the supervisor is also required. For further information, please contact the Awards Specialist, Room 1511, Dunton Tower.

### **Rudelle Hall Memorial Scholarship**

Endowed in 1995 by family and friends in memory of Rudelle Hall, a graduate of the Master of Arts program, this scholarship is awarded annually, when merited, to a graduate student who is doing work in the area of women's studies. Preference will be given to a female student who is specializing in eco-feminism.

Application is not required. The recipient will be selected by the Dean of the Faculty of Graduate Studies and Research from a list of candidates recommended by the departments, schools, and institutes having graduate programs.

### **The Michael Hare Fellowship**

The fellowship was endowed in 1988 by colleagues, friends, and family in memory of Michael Hare, a graduate of the master's program in geography and former senior proctor in the department.

The fellowship is normally awarded annually to a student in the third or subsequent term of a graduate program in the Department of Geography. It may be held in combination with a teaching or research assistantship. Application is not required; the recipient will be selected by the departmental graduate studies committee. The award is made on the basis of academic achievement combined with a tangible contribution to the quality of the working environment for students in the department.

### **Neil Huckvale Memorial Scholarship**

This award was established in 1981 by family, friends, and colleagues in honour of Neil Huckvale, a former graduate student in the Department of Geography. The recipient will reflect Neil Huckvale's humanity and philosophy, and will be chosen on the basis of merit and special interest in teaching and resource conservation.

The scholarship will normally be awarded annually to a student enrolled in the third or subsequent term of a graduate program in geography. It may be held in combination with a teaching or research assistantship. Application is not required; the recipient will be selected on the recommendation of the graduate studies committee. If an award is not appropriate in a given year, it will be held over so as to allow more than one recipient in a subsequent year.

### **The Ina Hutchison Award in Geography**

Established in 1989, the fortieth anniversary of the founding of geography at Carleton, this award is presented annually. Its primary purpose is to assist graduate students in geogra-

phy undertake research, but it may also be used to assist graduate students in the preparation of manuscripts for publication and to facilitate conference participation. The recipient(s) will be chosen each year on the recommendation of a Department of Geography selection committee.

### **Agnes. B. Ireland Bursary**

This bursary, valued at \$4,800, was established from the Estate of Agnes Mary Ireland. It is awarded to a student who requires financial assistance, has completed an undergraduate degree at Carleton University in either the Faculty of Arts and Social Sciences, the Faculty of Public Affairs and Management or the Faculty of Science, and has enrolled in a graduate program within one year of graduation.

The recipient is chosen each year by the Dean of the Faculty of Graduate Studies and Research from a list of candidates recommended by departmental chairs and school directors. This bursary is open only to permanent residents of Ontario.

### **Zbigniew A. Jordan Scholarship**

This award, established in 1978 by friends and colleagues in honour of the late Professor Zbigniew A. Jordan, is open to all graduate students in sociology.

Application is not required; the recipient will be chosen by the awards committee from candidates recommended by the Department of Sociology and Anthropology on the basis of merit and special interest in sociological theory and the philosophy of social sciences.

### **Joubin-Selig Bursaries in International Affairs**

The Joubin-Selig Bursaries in International Affairs, endowed in 1999 by the estate of Franc R. Joubin and the generosity of his daughter, Marion Selig, are awarded annually to continuing students in the master's program in The Norman Paterson School of International Affairs who need financial assistance in order to complete the program. Applications for the Joubin-Selig Bursaries should be made to the School of International Affairs.

Franc R. Joubin (1911-97) was a well-known Canadian geologist and a member of the Canadian Mining Hall of Fame. He traveled extensively during his career, working for almost 20 years with the United Nations, and had a lifelong interest in international relations and world peace.

### **Joubin-Selig Scholarship in International Affairs**

The Joubin-Selig Scholarships in International Affairs, endowed in 1999 by the estate of Franc R. Joubin and the generosity of his daughter, Marion Selig, are awarded annually to outstanding students entering the master's program in the Norman Paterson School of International Affairs. Recipients are selected by the School of International Affairs.

Franc R. Joubin (1911-97) was a well-known Canadian geologist and a member of the Canadian Mining Hall of Fame. He traveled extensively during his career, working for almost 20 years with the United Nations, and had a lifelong interest in international relations and world peace.

### **The Kalmen Kaplansky Scholarship in Economic and Social Rights**

This scholarship was established in 1998 by the Douglas-Coldwell foundation in honour of the lifetime achievement of Dr. Kalmen Kaplansky, labour and human rights advocate, in the field of economic and social rights.

Awarded annually to a graduate student researching economic and social rights in a School or Department in the Faculty of Public Affairs and Management at Carleton University, the scholarship is valued at \$1,000. A detailed letter of application for the award should be made by February 1 to the Dean of Public Affairs and Management, who will select the recipient on the advice of a three-person faculty advisory committee.

### **The Eve Frankel Kassirer Memorial Scholarship**

The Eve Frankel Kassirer Memorial Scholarship is awarded annually, when merited, on the recommendation of the Dean of the Faculty of Graduate Studies and Research, Carleton University, to a graduate student in sociology with research interests relating to ethical issues, the family, or allied health professions. It was endowed in 1988 by family and friends in memory of Eve Kassirer.

Eve was one of the first students to receive a master's degree in sociology from Carleton University.

### **Eldon Kaye Memorial Scholarship**

Awarded annually, on the recommendation of the Chair of the Department of French, to an undergraduate or graduate student in the French program who has demonstrated the most promise in French literature. Endowed in 1989 in memory of Eldon Kaye, who was a professor in the Department of French.

### **Dr. Roger Kaye Memorial Scholarship**

Awarded annually to a deserving graduate student within the department of Systems and Computer Engineering who is a resident of Ontario and requires financial assistance to continue his/her studies at Carleton University. Preference is given to students who are undertaking studies in the field of telecommunications, and more specifically in the area of telecommunications network performance or management, of the highest academic level of excellence in collaboration with one or a consortium of Canadian corporations. Endowed in 1997, the donors include colleagues, family and friends in memory and honour of the late Dr. Roger Kaye, Professor of Systems and Communication Engineering.

### **Sherine Khalil Memorial Bursary in International Affairs**

Awarded annually to a deserving full-time student enrolled in the M.A. program in International Affairs who is undertaking work on a thesis related to developmental issues in the Third World, and who is in need of financial assistance in order to complete his/her studies. Endowed in 1990 by friends and family of Sherine Khalil, a graduate student in the Norman Paterson School of International Affairs, who died tragically in the summer of 1990.

The recipient will be selected by the Dean of the Faculty of Graduate Studies and Research from a list of possible candidates submitted each year by the Director of the School of International Affairs.

### **Erwin and Herbert Kreyszig Scholarship**

This scholarship, valued at \$5,000 over one academic year (three terms), is awarded annually, on the recommendation of the Director of the School of Mathematics and Statistics.

The recipient of this scholarship may be eligible for consideration for an Ontario Graduate Scholarship in Science and Technology, which, if it were awarded, would raise the scholarship to \$15,000 over three terms.

Students must meet the eligibility requirements for the OGSST in order to qualify for these matched funds. The student must have maintained an overall average of at least A- or equivalent over the last two full years of study at the post-secondary level. The student must also exhibit research ability or potential; excellent communication skills; and interpersonal and leadership abilities.

Established in 2000 by Dr. Erwin Kreyszig and his son Herbert Kreyszig.

### **Margaret Wade Labarge Graduate Student Research Assistance Fund**

Awarded annually to deserving graduate students in the Faculty of Arts and Social Science, with preference for students in the humanities. These awards are intended to provide financial assistance to graduate students for the completion of their research when no other source of assistance is available. The recipients will be chosen by the Dean of the Faculty of Graduate Studies and Research. Endowed in 1997 by Dr. Margaret Wade Laberge, C.M.

### **The Pierre Laberge Research Essay/Thesis Prize for International Affairs**

Awarded annually to a student in the Norman Paterson School of International Affairs who writes the best research essay/thesis on a topic that addresses normative or ethical issues in the field of international affairs. The prize is established in honour of the late Pierre Laberge, Professor of Philosophy and former Dean of Graduate Studies and Research at the University of Ottawa, who attended the School in 1989-92. A distinguished Kantian scholar, Professor Laberge's work in recent years focused on the vitally important questions of moral choice and ethics in international affairs. The recipient is chosen on the recommendation of a Norman Paterson School of International Affairs selection committee. The award consists of a sum of money and a book.

### **Lambda Foundation for Excellence Award**

This bursary, valued at \$700 or more as funds become available, is to encourage excellence in research on the subject of gay and lesbian, bisexual and transgendered peoples. The recipients will be announced by the Dean of the Faculty of Graduate Studies and Research based on nominations received from academic units.

### **Christoph Lehmann-Halens Memorial Award**

Awarded annually, when merited, to a student enrolled in the Master of Journalism degree program at Carleton. While good academic standing is an important consideration, demonstrated interest in the issues of disarmament and/or environmental protection and/or feminist concerns are the main criteria for selection.

The recipient will be chosen each year on the recommendation of the Director of the School of Journalism and Communication.

This award in memory of Christoph Lehmann-Halens, who died tragically in Libya while on assignment, was established in 1987 by his family, friends, and Southam News.

### **The Helen Levine Bursary**

This bursary may be awarded to one or two students who require special financial assistance in order to complete their studies in social work. Preference will be given to female students who have demonstrated an interest in pursuing research and practice in women's issues or feminist counselling.

The selection of the recipient will be made upon the recommendation of the Director of the School of Social Work.

Endowed in 1990 in honour of retired Professor Helen Levine, recipient of the Governor General's Persons Award for 1989.

### **Lewar Graduate Scholarship in Arts and Social Sciences**

This scholarship was established in 1998 by the Estate of Richard Lewar, a former Commerce student who attended Carleton University from 1974 - 1979, and a long time supporter of the University. To the value of \$6,500 over three terms this scholarship is awarded to an outstanding student in the first year of a graduate program in the Faculties of Arts and Social Sciences and Public Affairs and Management. The award may be held for up to two years by a master's student and up to four years by a doctoral student. In the second and subsequent years the amount of the scholarship is \$4,000. Continuation of the award is determined by the Awards Committee of the Faculty of Graduate Studies and Research from amongst candidates recommended by the schools and departments of the Faculties.

### **Lewar- Ontario Graduate Scholarship in Science and Technology, Engineering and Science**

This scholarship, established in 1998, is partially funded by the Estate of Richard Lewar, a former Commerce student who attended Carleton University from 1974 - 1979 and a long time supporter of the University, and the Province of Ontario. To the value of \$9,000 over three terms, this scholarship is awarded to an outstanding student in the first year of a graduate program in the Faculties of Science and Engineering and Design. The award may be held for up to two years by a master's student and up to four years by a doctoral student, but for each year re-application is required.

Applicants must be Canadian citizens or landed immigrants and must have an A- average in the last two years of post-secondary education. The award is adjudicated by a committee of the Faculty of Graduate Studies and Research.

### **The John Lyndhurst Kingston Memorial Scholarship**

This scholarship was endowed in 1984 by Mrs. Leslie Kingston in memory of her late husband John L. Kingston, Architect. It is awarded annually to an outstanding graduate student studying in a discipline within the Faculties of Arts and Public Affairs and Management, Social Sciences, Science (including Computer Science), or Engineering, whose work is aimed at the betterment of our society.

Application is not required. The recipient will be selected by the Dean of the Faculty of Graduate Studies and Research from a list of candidates recommended by departmental chairs from the above faculties.

### **R.O. MacFarlane Memorial Award**

This award is presented annually to an outstanding student registered in a graduate program in the School of Public Administration at Carleton University. Endowed in 1971 by relatives, friends, and graduates of Carleton University, the award is named in honour of the late R. Oliver MacFarlane, the first director of the School of Public Administration, 1953-1971.

### **R.A. MacKay Memorial Fund**

This fund was established in 1980 by relatives, friends, and former colleagues of the late R.A. MacKay, a distinguished scholar in Canadian government, a senior member of the Department of External Affairs, professor of political science at Carleton University from 1961, and founding associate director of the Norman Paterson School of International Affairs, 1966-68.

The award is intended to assist graduate students from outside Canada who are studying international affairs at Carleton University; they may be enrolled in the Norman Paterson School of International Affairs or come from a related discipline, such as political science, history, or economics, provided that the "international" component of their course of study is prominent.

### **The Vic Mallet Scholarship**

This scholarship commemorates Vic Mallet, an outstanding student of the Department of English, who died tragically in a car accident. Established by the department and by his family and friends, it is awarded annually, when merited, to the student with the highest academic standing on admission to the master's program. Application is not required; the recipient will be chosen on the recommendation of the Department of English.

## **Robert and Alyce Martin Scholarship in Journalism**

This scholarship was endowed in 1999 by the Estate of Eleanore Roberta Powell and is valued at \$9,800. The award is made annually to outstanding students entering the Master of Journalism program. Students will be selected by the Master of Journalism admissions committee.

As a journalist, Mrs. Powell served as a reporter for the Ottawa Citizen during the Second World War. She later joined the women's division of the Royal Canadian Air Force and worked as a public relations officer for the RCAF in Ottawa, Newfoundland and for the RAF HQ in London, England. She moved back to Ottawa after the war with her husband, Leslie C. Powell. The scholarship is named in honour of her parents, Robert and Alyce Martin.

## **The Dewan Chand and Ratna Devi Marwah Memorial Scholarship in Mathematics and Statistics**

This scholarship, valued at \$1,000, was endowed in 1984 by Professor Kanta Marwah of the Department of Economics in honour and memory of her parents. It will be awarded annually to the most outstanding and deserving graduate student within the Department of Mathematics and Statistics, preferably to a doctoral candidate who, having successfully completed all course and comprehensive requirements, is undertaking completion of a dissertation.

No application is required. The recipient will be selected by the Scholarship Committee, composed of the Chair of the Department of Mathematics and Statistics, the Director of the Ottawa-Carleton Institute of Mathematics and Statistics, and Professor Kanta Marwah or her designate. The recipient of the award will be announced by the Dean of the Faculty of Graduate Studies and Research in September each year. In a given year, the award may not be made for lack of a suitable candidate.

## **P.D. McCormack Fund**

The purpose of the fund is to establish a memorial in perpetuity to Peter D. McCormack. The P.D. McCormack Fund is to be used for the support of graduate students in general experimental psychology in the Department of Psychology. Support may be direct (e.g., scholarships) or indirect (e.g., support of a graduate student reading room). The Chair of the Department of Psychology shall determine the deployment of funds on an annual basis.

The P.D. McCormack scholarships should be considered as prestige awards in a manner similar to the Epstein Fellowships. The Dean of

the Faculty of Graduate Studies and Research, in collaboration with the Chair of the Department of Psychology, will determine the number and amount of the awards in January of each year to be awarded in the following fall.

## **The Bruce McFarlane Bursary**

In honour of Dr. Bruce McFarlane and in recognition of his outstanding contributions during 33 years as a teacher and a scholar at Carleton University, on the occasion of his retirement in 1992, his friends, colleagues, and former students established this bursary. The Bruce McFarlane Bursary is available to full-time graduate students from the Department of Sociology and Anthropology or the Norman Paterson School of International Affairs who need financial assistance in order to meet tuition fees or cover research costs. Application is not required. The recipient(s) will be selected each year by the Dean of the Faculty of Graduate Studies and Research from candidates recommended by the above units.

## **Violet McLaughlin Scholarship**

This scholarship, which carries a value of up to \$1,000, was established in 1984 and is derived from a legacy of the late Violet McLaughlin to graduate students in the School of Social Work.

Two scholarships will normally be awarded each year: one to a graduate student who, upon admission, possesses the highest academic standing; and one to a student achieving the highest academic standing at the end of the first year of the program.

Application is not required; the recipients will be chosen by the awards committee from candidates recommended by the School of Social Work.

## **The Stanley Mealing Bursary**

Established in 1990 by former students, friends, and colleagues of Professor Stanley Mealing on the occasion of his retirement, this bursary is available to full-time master's or Ph.D. students in history who require financial assistance in order to continue their studies at Carleton University.

Applications should be made to the Chair of the Department of History. The selection of the recipient(s) each year will be made upon the recommendation of a selection committee comprised of the Department of History graduate committee.

## **Chet Mitchell Memorial Award in Law**

Established in 1991 by colleagues, family, and friends in honour of the late Chet Mitchell, who was a professor in the Department of Law, this

award is given annually to a deserving student enrolled in the Master of Arts program in legal studies.

Application is not required. The recipient will be chosen each year on the recommendation of the Chair of the Department of Law.

### **Molecular Recognition and Inclusion Scholarship**

Endowed in 1995 by the organizing committee of the 8th International Symposium on Molecular Recognition and Inclusion, this scholarship will be awarded annually to an outstanding student entering a graduate program in the Ottawa-Carleton Chemistry Institute. The scholarship will be used to encourage young researchers to enter the field of Molecular Recognition and Inclusion. Application is not required. The name of the recipient will be announced by the Dean of the Faculty of Graduate Studies and Research, on the recommendation of the Director of the Ottawa-Carleton Chemistry Institute.

### **Roy Buckley Morrison Scholarship**

This scholarship was established in 1979 in honour of the late Roy Buckley Morrison by Panasonic/ Matsushita Electric of Canada Limited, and friends and associates. It will normally be awarded to a Canadian citizen or permanent resident of Canada registered in the Norman Paterson School of International Affairs.

Application is not required; the recipient will be chosen by the awards committee from candidates recommended by the School on the basis of merit and special interest in conflict analysis and/or studies in strategy and security.

### **George Mulligan Memorial Scholarship**

Established in 1989 by colleagues and friends of the late George Mulligan, who was a partner of Toronto Investment Management Inc., this scholarship is awarded annually, when merited, to a deserving student enrolled in the Master of Management Studies program to assist in the undertaking of research for a thesis dealing with investment management.

Application is not required. The recipient will be selected on the recommendation of the Director of the School of Business. In a given year, the award may not be made for lack of a suitable candidate, but will be held over so as to allow more than one recipient in a subsequent year.

### **Norman Paterson School of International Affairs Alumni Association Forfeited Student Bursary**

Endowed by the alumni of the Norman Paterson School of International Affairs (NPSIA) in 1990, this bursary is awarded annually to one or more foreign students, admitted full time in the M.A. program in international affairs, who require(s) financial assistance in order to study at Carleton University.

The recipient will be chosen by a selection committee composed of the Director of the School of International Affairs, two representatives from the NPSIA Alumni Association, and one other faculty member from the School of International Affairs. The name of the recipient will be announced by the Dean of the Faculty of Graduate Studies and Research.

Interested applicants should contact the Director of the School of International Affairs. The bursary may not be awarded if there is no qualified candidate. In such cases it will be held over so as to allow more than one recipient in a subsequent year.

### **Nortel Networks Graduate Scholarships**

Established in 1999 by Nortel Networks, up to 10 scholarships each valued at \$10,000 over three terms will be awarded to outstanding graduate students at either the master's or the doctoral level in Computer Science, Electronics and Systems and Computer Engineering who show outstanding research potential. The scholarships are renewable and may be held for up to two years for master's students and up to four years for doctoral students.

### **Maureen O'Neil Award in Women's Studies**

This award was endowed in 1985 by Canadian Hadassah-WIZO in honour of Maureen O'Neil, Coordinator, Status of Women Canada. It is awarded annually, when merited, to a student enrolled in the Faculty of Graduate Studies and Research who is doing work in the area of women's studies.

Application is not required. The recipient will be selected by the Dean of the Faculty of Graduate Studies and Research from a list of candidates recommended by each department within the Faculties of Arts or Social Sciences.

### **Robert E. Osborne Award**

Awarded annually, on the recommendation of the Chair of the Department of Religion, to an undergraduate or graduate student in the religion program. Preference, in order, will be given in the areas of New Testament, biblical, and

other forms of religious studies. Endowed in 1986 in memory of Robert E. Osborne who was a professor in the Department of Religion.

### **Khayyam Zev Paltiel Doctoral Dissertation Prize in Social Philosophy, Social Theory, or Social Policy**

This prize, endowed by Professor Khayyam Z. Paltiel of the Department of Political Science, is intended to provide a fund to assist in the publication of a deserving doctoral dissertation presented to the Faculty of Graduate Studies and Research at Carleton University in the fields of social philosophy, social theory, or social policy. The prize is awarded biennially to the best doctoral dissertation presented in these fields in the previous two-year period. The prize is not intended to be confined to students in a particular discipline; doctoral dissertations in the appropriate fields may be presented in political science, sociology and anthropology, economics, psychology, and history. Dissertations are nominated for the prize by the doctoral examining boards; adjudication is by a committee chaired by the Dean of the Faculty of Graduate Studies and Research and including the appropriate faculty deans together with the chairs of the relevant departments.

### **Paterson Fellowships**

From the generous support provided by the late Senator Norman M. Paterson when the School was established in 1966, funds are allocated to support some candidates for the M.A. degree in the Norman Paterson School of International Affairs.

All those with high standing who are admitted to this program are considered for these fellowships.

### **Lester B. Pearson Scholarships**

These scholarships, which were established in 1990 by a bequest from the estate of the late Lester B. Pearson, will be awarded after the first term of each academic year to three graduate students working in the areas of Canadian foreign policy, politics, or history. The awards, having a value of approximately \$1,000 each, will be made on the recommendations of the Director of the School of International Affairs and the Chairs of the Departments of Political Science and History.

### **The Norman Pollock Memorial Award for Latin American Studies**

This award is presented annually to an outstanding student in the areas of Canadian-Latin American relations or Latin American development studies. It has been endowed to honour

the memory of Norman Pollock by his son David H. Pollock and his granddaughter Susan A. Harkavy.

Application is not required. The recipient will be selected by the Dean of the Faculty of Graduate Studies and Research from candidates nominated from relevant graduate programs.

### **John Porter Graduate Bursary**

An annual bursary of \$1,000 awarded to an M.A. student in sociology who requires financial assistance in order to complete studies at Carleton University. The selection of the recipient will be on recommendation of the Coordinator of Graduate Studies, Department of Sociology and Anthropology.

### **Pratt & Whitney Canada Graduate Scholarship**

Established in 1996, this scholarship is valued at \$2,000. It is awarded annually, when merited, to a student entering the Master of Engineering program in Mechanical and Aerospace Engineering specializing in gas turbine technology. Application is not required. The recipient will be selected by the Dean of the Faculty of Graduate Studies and Research on the recommendation of the Chair of the Department of Mechanical and Aerospace Engineering.

### **Residence Fellowships**

Applications are invited from graduate and senior undergraduate students with good academic standing. The Residence Fellowship responsibilities include supervision of a floor in residence, enforcement of community regulations, and counselling of students in residence. An excess of twenty hours per week is required to meet job responsibilities satisfactorily. Please note that the selection process demands that candidates attend an interview and a workshop in the second term.

Application forms may be obtained from the office of Housing and Food Services, Carleton University, 1125 Colonel By Drive, Ottawa, Ontario, K1S 5B6. The deadline for receipt of applications is January 15.

### **Rogers Communications Award in Mass Communication**

Awarded annually to an outstanding student enrolled in the Master of Arts in Communication program. The recipient will be selected by the awards committee of the Mass Communication Program. Endowed in 1991 by Rogers Ottawa Ltd.

## **Rogers Communications Award in Television Journalism**

Awarded annually on the recommendation of the School of Journalism and Communication to the student graduating from the Master of Journalism program who shows the most promise as a television journalist. Endowed in 1991 by Rogers Ottawa Ltd.

## **The Roderick S.J. Rooney, F.C.A. Memorial Scholarship**

This scholarship was endowed in 1985 by Mrs. Isabella M. Rooney in memory of her late husband Roderick S.J. Rooney, F.C.A. It is awarded annually to an outstanding student who is enrolled in the Master of Social Work program.

Application is not required. The selection of the recipient will be decided on the recommendation of the Director of the School of Social Work.

## **William and Margaret Roxburgh Memorial Award**

This award was established in 1981 by Gwenda and Ross Roxburgh, and is open to all graduate students in the School of Canadian Studies. The amount of \$250 is provided annually to assist students in carrying out research projects.

Application should be made to the Director of the School of Canadian Studies; recipients will be chosen from a list of candidates recommended by the Director.

## **John Ruptash Memorial Fellowship**

This fellowship was established in 1974 by relatives, former students, faculty colleagues, and friends as a memorial to the late John Ruptash, who was Dean of the Faculty of Engineering and later Dean of the Faculty of Graduate Studies and Research from 1959 to 1973. The fellowship has been awarded annually, beginning in 1975-76, to an outstanding graduate student in the Faculty of Engineering; it may be held in combination with a teaching or research assistantship.

Application is not required; the recipient will be chosen by the awards committee of the Faculty of Engineering.

## **Imam Tawfiq Shaheen Memorial Scholarship**

This scholarship was established in 1998 by the Ottawa Muslim Association in memory of the late Dr. Tawfiq Shaheen who was the imam of the Ottawa Mosque from 1980-1997. It is awarded annually, when merited, on the recommendation of the Dean of the Faculty of

Arts and Social Sciences, to a full-time student enrolled in an undergraduate or graduate program who undertakes a research project embracing, among other Islamic subjects, Islamic religion, Islamic jurisprudence, Islamic art, Islamic history, Islamic culture, Islamic ethics or Islamic philosophy.

## **Shannon Scholarships in Canadian Social History**

Established in 2000 by an anonymous donor, these scholarships are awarded on the recommendation of a selection committee, composed of the chair of the Department of History and two other faculty members, chosen by the chair, to outstanding graduate and/or undergraduate students studying full-time in the field of Canadian social history, immigration, migration or local history, with preference to those with research interests in British and Irish immigration to Canada or the local history of eastern Ontario and western Quebec.

## **The Arnold Smith Award in International Affairs**

Valued at \$1,500, this award was established in 1990 by the North-South Institute in honour of the outstanding contribution made to the Institute by its Chair of the Board, Mr. Arnold Smith. It is awarded annually, when merited, to a student who is enrolled full-time in the Master of Arts program in international affairs, is following the development studies core, and whose work focuses on Canadian policies toward developing countries in aid, trade, or international finance. Application is not required. The recipient will be selected each year by the Dean of the Faculty of Graduate Studies and Research on the recommendation of the Director of the School of International Affairs.

## **The Arnold Smith Commonwealth Scholarship**

This scholarship will be awarded annually from funds provided by the Royal Commonwealth Society, Ottawa Branch, to a student from a Commonwealth country other than Canada in any field of study at the graduate level. The award will be based on academic excellence and seeks to recognize students who will use their studies to contribute to the development of their country of origin.

Application is not required. The recipient will be chosen by the awards committee of the Faculty of Graduate Studies and Research from a list of candidates recommended by each department.

## Social Sciences Graduate Bursary

This fund is made possible by contributions from staff and faculty employees in the social sciences. Support of up to \$100 is available to graduate students nearing the completion of their program and experiencing financial difficulty in meeting the costs of typing/ reproduction of an M.A. or Ph.D. thesis.

Application should be made to the chair/director of the student's department, for referral with recommendation to the Dean of Arts and Social Sciences or the Dean of Public Affairs and Management, where applicable.

## Nicholas P. Spanos Memorial Award in Psychology

This award, established in memory of Professor Nick Spanos, a faculty member at Carleton University from 1975 to 1994, is presented to graduate students in the Department of Psychology who have shown exceptional research achievement. The award is supported by the generosity of the family and friends of Professor Spanos.

Professor Spanos was a prolific researcher in the areas of hypnosis, multiple personality disorders, spousal abuse, ritualistic behaviours, false memory syndrome, imagery, absorption, and other topics too numerous to list. Journal citations placed Professor Spanos as a leading world publisher in social psychology. He was a proud mentor for many graduate and undergraduate students in his years at Carleton.

Application is not required. Four awards, valued at approximately \$100 each, are presented each year to students in the Department of Psychology on the recommendation of the Graduate Committee of the Department of Psychology.

## Special Bursary for Students in Social Work

This bursary, in the amount of \$1,000 annually, may be awarded to one, or divided between two students in the School of Social Work who require special financial assistance in order to complete their studies at Carleton University. The selection of the recipient(s) will be decided on the recommendation of the Director of the School of Social Work.

## The Frank Stone Memorial Prize

Awarded annually, when merited, to a student graduating from the M.A. program in international affairs who presents the best thesis or research essay on Canadian trade policy. Endowed in 1990 by friends and colleagues of the late Frank Stone in honour of his contribution to the study of trade policy in Canada and to encourage others to follow in his footsteps.

Application is not required. The selection of the recipient will be decided on the recommendation of the Director of the School of International Affairs, and the winner will be announced each year by the Dean of the Faculty of Graduate Studies and Research.

## Colonel William B. Sutherland Bursary

Awarded annually on the recommendation of the Director of the School of Canadian Studies, to a Canadian Studies graduate student who demonstrates the need for financial assistance in order to excel in their studies. Preference is given to students enrolled in the Cultural Studies or Aboriginal Studies and the North program areas. Endowed in 2000 by the Sutherland family in tribute to the passion for the pursuit of knowledge that Colonel Sutherland has exemplified in all aspects of life. The award is intended to provide support for students who share this spirit.

## Maxwell Taylor Scholarship

This scholarship, which was endowed in 1998 by a bequest from the estate of the late Mabel Leona Taylor, is awarded annually to a student in his/her final year of the master's program in Architecture who incorporates building technologies into his/her thesis project. The recipient will be chosen by the Director of the School of Architecture.

## Michael Thompson Scholarship in English

Awarded annually, on the recommendation of the Chair of the Department of English Language and Literature, to the English Honours student with the highest GPA who is proceeding from third to fourth year of the Honours program, or from fourth year to Carleton's Master of Arts program in English. Endowed in 1992 by colleagues, friends, and former students in honour of Professor Michael Thompson's many contributions to the Department and to the University.

## Philip E. Uren Fellowships

Two fellowships are awarded annually, one to a graduate student in the Department of Geography and one to a graduate student in the Norman Paterson School of International Affairs, and may be held in combination with a teaching or research assistantship. Application is not required; the recipient will be chosen by the Dean of the Faculty of Graduate Studies and Research on the recommendation of the awards committees from the academic units involved. The fellowships were established in 1980 by relatives, friends, former students, and faculty and staff colleagues as a memorial to the late Philip Ernest Uren who was a professor

of geography between 1965 and 1979, and who served the University as Chair of the Department of Geography, Director of the Institute of Soviet and East European Studies, Director of the Norman Paterson School of International Affairs, and Director of the Paterson Centre for International Programs.

### **Frank Vallee Scholarship in Anthropology**

This scholarship was established in 1999 by family and friends of Dr. Frank Vallee, a respected professor of social anthropology and former chair of the Department of Sociology and Anthropology at Carleton University. This \$1,000 scholarship is awarded to a deserving graduate student of Aboriginal ancestry, whose area of research is anthropology.

Applications are not required. The recipient will be chosen by the awards committee of the Faculty of Graduate Studies and Research from a list of candidates submitted by the Chair of the Department of Sociology and Anthropology.

### **The Varian Graduate Scholarship in Analytical/Environmental Chemistry**

This Scholarship was established in 1992 by Varian Canada in recognition of its involvement in the development of the Centre for Analytical and Environmental Chemistry, in the Department of Chemistry. Valued at \$2,000, this scholarship is awarded annually to an outstanding graduate student who is carrying out research in the Centre for Analytical and Environmental Chemistry. Application is not required; the recipient will be announced by the Dean of the Faculty of Graduate Studies and Research based on recommendation from the Department of Chemistry.

### **Norma E. Walmsley Award for International Understanding**

Valued at \$2,500, this award, established in 1955 by MATCH International Centre, is to honour Dr. Norma E. Walmsley, O.C., the organization's Founding President, for distinguished service to Canada and for her outstanding contribution to the international community through university teaching and imaginative leadership in governmental and non-governmental agencies.

It is awarded annually, when merited, to a student or students who is/are enrolled full-time in the Master of Arts program in International Affairs and whose work will further international understanding between Canadian women and women of Africa, Asia, the Caribbean and Latin America.

Application is not required. The recipient will be selected each year by the Dean of the Faculty of Graduate Studies and Research on the recommendation of the Director of the School of International Affairs.

### **Gabriel Warshaw Memorial Scholarship**

Established in 1998 in honour and memory of Dr. Gabriel David Warshaw. Dr. Warshaw received his Master of Engineering and Doctor of Philosophy degrees at Carleton University and was active in the Canadian and international space programs as a partner of Routes, Inc., Ottawa, until his untimely passing in 1998.

Valued at \$1,000, this scholarship is awarded annually to an outstanding graduate student in either the Department of Systems and Computer Engineering or Mechanical and Aerospace Engineering, aspiring to a career based on the peaceful and environmentally respectful applications of these disciplines. The recipient will be selected by a committee comprised of the Dean of the Faculty of Graduate Studies and Research and a representative of the donors from candidates recommended by the Chairs of these departments. It may not be awarded in a given year for lack of a suitable candidate.

### **Charlotte Whitton Fellowships in Canadian Urban Life**

In honour of the distinguished contribution of the late Charlotte Whitton to Canadian urban life and politics, and her long association with Ottawa, up to two fellowships in urban life will be awarded annually to the student(s) in the School of Canadian Studies with the highest standing on admission. The proposed field(s) of study must relate to urban life and problems.

The recipient(s) will be chosen by the Dean of the Faculty of Graduate Studies and Research on the advice of the Director of the School of Canadian Studies.

### **Alice E. Wilson, F.R.S.C. Scholarship in Geoscience**

This scholarship, valued at \$1,000, was established in 1995 by the Canadian Federation of University Women/Ottawa. It is in honour of Alice E. Wilson, F.R.S.C., a paleontologist with the Geological Survey of Canada, and a charter member of the Canadian Federation of University Women/Ottawa when it was founded in 1910.

It is awarded annually, when merited, to a graduate student enrolled in the Ottawa-Carleton Geoscience Centre. Application is not required. The recipient will be selected on the

recommendation of the Director of the Centre. Preference will be given to students who are returning to studies after absences due to family responsibilities.

### **The S.F. Wise Graduate Bursary**

Established in honour of a former Dean of the Faculty of Graduate Studies and Research, the bursary is awarded annually to an outstanding graduate student registered in the thesis portion of a doctoral program in the Humanities (History, Literary Studies, Linguistics and Applied Language Studies, Studies in Art and Culture, and Canadian Studies) who requires financial assistance in the final stages of the program. If no suitable doctoral candidate is forthcoming, the bursary may be awarded to a student registered in a thesis-based master's program in the same disciplines.

The recipient is chosen each year by the Dean of the Faculty of Graduate Studies and Research from a list of candidates recommended by departmental chairs and school directors. This bursary is open only to permanent residents of Ontario.

### **YTV Canada Inc. Youth and Television Award**

Established in 1992 by YTV Canada Inc., this scholarship, valued at \$1,500, is awarded annually to a student enrolled in the Master of Arts program in Communication, whose thesis topic is related to youth and television.

Application is not required. The selection of the recipient will be made upon the recommendation of the School of Journalism and Communication to the Dean of the Faculty of Graduate Studies and Research.

### **David and Rebecca Zelikovitz Scholarship**

Endowed in 1991 through a bequest from the estate of the late David Zelikovitz, this scholarship is awarded annually to a deserving graduate student who is studying Jewish culture.

Application is not required. The recipient will be selected by the Dean of Graduate Studies and Research from among those candidates recommended each year by departments, schools and institutes having graduate programs.

### **Awards Tenable at Carleton University**

### **Commonwealth Scholarships and Fellowships**

The Government of Canada, through the Commonwealth Scholarships and Fellowships Com-

mittee, offers annually a number of scholarships and fellowships, normally tenable for two years, which cover such expenses as travelling costs, tuition fees, other University fees, and a living allowance to students of other Commonwealth countries.

Under a plan drawn up at a conference held in Oxford in 1959, these scholarships and fellowships are awarded mainly for graduate study, and are tenable in the country making the offer.

Students are advised to consult Carleton International. The deadline for receipt of applications is October 26 for all awarding countries except New Zealand. The deadline for receipt of applications for New Zealand awards is December 24. For further details, please contact the International Council for Canadian Studies/Conseil International d'études canadiennes, 325 Dalhousie, S-800 Ottawa, Ontario, Canada, K1N 7G2, or their Web site at: <http://www.iccs-ciec.ca>.

### **I.O.D.E. War Memorial Scholarships**

Up to a maximum of nine scholarships are offered annually by the Imperial Order Daughters of the Empire for postgraduate study and research in the humanities or social sciences. The awards are valued at \$15,000 for study in Britain or another country in the Commonwealth, and \$12,000 for study in a Canadian University.

Candidates must be Canadian citizens and graduates of recognized colleges or universities.

Application forms are available from the office of the Faculty of Graduate Studies and Research. The deadline is December 1.

### **Sir John A. Macdonald Graduate Fellowship in Canadian History**

The Province of Ontario annually offers the Sir John A. Macdonald Graduate Fellowship, valued at \$8,500, for full-time graduate studies and research in the field of Canadian history at the Ph.D. level. The fellowship is tenable for three years, at an Ontario University only, and it will be awarded to a Canadian citizen resident in Ontario.

Application forms and additional information can be obtained from the Graduate Studies and Research office. The deadline for submission of completed applications to the Dean of the Faculty of Graduate Studies and Research is March 15.

### **Department of National Defence Scholarships and Fellowships**

The Department of National Defence offers scholarships and fellowships for strategic stud-

ies of relevance to current and future Canadian national security problems, including their political, economic, social, and military dimensions. Four Ph.D. scholarships valued at up to \$16,000 and eight M.A. scholarships valued at up to \$8,000 will be awarded to cover tuition fees and related expenses.

Applicants must be Canadian citizens. The deadline is February 1.

For further details, please contact : Canadian Awards Program, International and Canadian Programs Branch, AUCC, 600-350 Albert Street, Ottawa, ON K1R 1B1

Information is also available on the AUCC website at [www.aucc.ca](http://www.aucc.ca)

## **Natural Sciences and Engineering Research Council**

NSERC Postgraduate Scholarships (range \$17,300 - \$19,100 a year) are tenable at Carleton University by students undertaking advanced studies and research in science, engineering, experimental psychology, and physical geography.

Students currently enrolled at Carleton University must apply through their departments on prescribed forms available from the office of the Faculty of Graduate Studies and Research. Departments will advise students of relevant deadlines. Candidates are advised to consult the Council's Web site at: [www.nserc.ca](http://www.nserc.ca)

## **Ontario Graduate Scholarships**

The Province of Ontario annually offers scholarships of \$5,000 per term (for two or three consecutive terms) to students who intend to pursue graduate studies at an Ontario University. Applicants entering the first or second year of graduate studies at the time of application are eligible if they have an average of at least A-, or the equivalent, on the last 20 one-term/semester courses, or the equivalent, completed. Applicants entering the third year or beyond of graduate studies at the time of application are eligible if they have an average of at least A-, or the equivalent, on all graduate courses completed. Application forms and brochures containing details of the award may be obtained from the student's department. Registered students should submit completed application forms to their department. The department will advise students of the relevant deadlines.

## **Ontario Graduate Scholarships in Science and Technology**

Established in 1999 by the Province of Ontario, this scholarship is awarded annually to students in science and technology disciplines including the applied sciences, biological and

life sciences, and physical sciences. The maximum value of the award is \$15,000 per annum or \$5,000 per term, of which one third is contributed by the private sector and two thirds by the Province of Ontario. Candidates nominated by departments/institutes/schools must be Canadian citizens or permanent residents, meet the academic requirements of the Ontario Graduate Scholarship and exhibit research ability or potential, excellent communication skills and interpersonal and leadership qualities.

## **J.H. Stewart Reid Memorial Fellowship**

This fellowship provides an award of \$5,000 for twelve months for any field of study in a doctoral program in any Canadian University. It is open to students who are Canadian citizens, or who have held landed immigrant status from April 30, 1999 or earlier. Candidates must have completed their comprehensive examinations, or equivalent, and have had their doctoral thesis proposal accepted by April 30, 2000, the closing date for application. Applications may be obtained from the Awards Officer, Canadian Association of University Teachers, 2675 Queensview Drive, Ottawa, Ontario, K2B 8K2.

## **Social Sciences and Humanities Research Council of Canada**

The Council offers fellowships ranging in value up to \$16,620 per year, for up to four years, for studies and research at the doctoral level in the humanities and social sciences. These fellowships are tenable in Canada or abroad for a maximum of twelve months and may be renewed upon application.

Departments will advise students of the deadline. The Guide to Applicants and application forms for the doctoral fellowship program are available on the Council's Web site at: [www.sshrc.ca](http://www.sshrc.ca)

## **Government Aid Programs**

### **Ontario Residents**

Canadian citizens or landed immigrants (permanent residents) who are residents of Ontario may qualify for assistance from the Ontario Student Assistance Program. The financial aid scheme is designed to supplement, rather than replace, family and/or student resources. In order to determine the additional funds required, the province objectively assesses the resources that could reasonably be used to provide for the student's educational costs. Interest-free Canada Student Loans and/or Ontario Student Loans are given to assist the student. The maximum loan a student can receive in one academic year is usually the total

amount of his or her allowable educational costs. Application forms and further information can be obtained by contacting the Awards office at Carleton or the Student Awards Branch of the Ministry of Education and Training, Fellowship Section, P.O. Box 4500, 189 Red River Road, 4th Floor, Thunder Bay, Ontario, P7B 6G9.

Students wishing to have applications processed in time for fall registration must ensure that completed forms are submitted to the Awards office by July 1.

### **Residents of Other Provinces/Territories Except Quebec**

Canadian citizens or landed immigrants (permanent residents) from the territories and all other provinces except Quebec may qualify for assistance from the Canada Student Loans Plan through their home province. The loan is interest free while the student is enrolled full time. Some provinces also make available non-repayable grant assistance along with this federal loan.

The Awards office disburses general information on the various provincial aid schemes, but application forms and details on individual programs must be obtained from the authorities in the home province. Deadline dates vary but, generally speaking, it is wise to apply for financial assistance through the appropriate provincial department before June 30.

### **Quebec Aid**

Applications from students for assistance from the province of Quebec should be made directly to the Awards office. Deadline dates for submission of applications are May 31 for all students who submitted an application for the previous school year and June 30 for all students who did not submit an application for the previous school year. In order to be accepted by the Department of Education, all applications must be coded by the Awards office.

The above government assistance programs are subject to change.

### **University Loan Funds**

#### **John Parker Loan Fund**

This fund was established to provide loans of up to \$1,000 to students in their first year of studies at Carleton University, and up to \$1,500 in future years to students who require financial assistance to meet their educational costs. This fund also provides emergency loans for 60 days or less to students whose funds from other sources have been delayed. Application forms are available to students in the Awards Office, Room 202, Robertson Hall, telephone 520-3600.

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**1. Administration of the Regulations****1.1 General Administration**

The regulations on the following pages apply to all degree, diploma and certificate programs administered by the Faculty of Graduate Studies and Research.

**1.2 Student Responsibility**

(i) The student is responsible for knowing the regulations of the Faculty of Graduate Studies and Research and for complying with them. Any exceptions to the regulations must be approved, in writing, by the Dean of the Faculty of Graduate Studies and Research. Routine approval of a records form does not constitute approval of an exception.

It is also each student's responsibility to establish and maintain contact with his or her faculty adviser or thesis supervisor.

(ii) In order for a student to receive his or her degree, he or she must fulfill:

- \* all the requirements of the department, school, or institute in which he or she is taking the degree;
- \* all faculty regulations;
- \* all University regulations;
- \* all financial obligations to the University.

**2. Admission Requirements and Eligibility****2.1 General Requirements**

Graduates of recognized universities will be considered for admission to the Faculty of Graduate Studies and Research. The University's general policy on admission is outlined below, but all applicants should refer to the departmental statements in this Calendar for

details concerning the specific or additional requirements of each department, institute, or school.

**2.2 Eligibility**

A combination of factors is taken into consideration in assessing the eligibility of a candidate for admission into one of the graduate programs:

\* the performance of the candidate and the assessment provided by his/her referees as a measure of the likelihood that the candidate can successfully complete the course of studies and research defined by the Senate of the University for the given degree

\* the capacity of the graduate department, institute, or school to provide a program of studies and research which would meet the expectations of the candidate as defined in his/her statement of academic interests and ambitions

\* the availability of a faculty member competent to supervise the academic program of studies and research of the candidate at the time.

**2.3 Qualifying-Year Program**

Applicants who do not qualify for direct admission to the master's program may be admitted to a qualifying-year program. Applicants who lack an Honours degree but have a 3 year degree with honours standing (at least B overall) will normally be admitted to a qualifying-year program.

If successful in this qualifying year and upon formal application to the Faculty of Graduate Studies and Research, the student may eventually proceed to the master's program. However, admission to the qualifying-year program does not imply automatic admission to the master's program. At the end of the qualifying-year program the student will be required to apply for entry into the master's program, at which time the department will determine the student's eligibility to enter the program. If successful, the student will be informed of this decision by the Dean of the Faculty of Graduate Studies and Research.

Applicants for a master's degree who have a program requirement of 7.5 credits or more (with the exception of the School of Public Administration and the School of Journalism and Communication) will register initially in the qualifying-year program.

Credits taken to fulfill the requirements of the qualifying-year program may not be used for credit for the master's degree. Courses taken extra to the program requirements of the qualifying year and which have been successfully completed may be considered for credit towards the master's degree.

## 2.4 Master's Program

For admission to the master's program, applicants must hold an Honours bachelor's degree, or the equivalent, with at least high honours standing (normally B+ or better in honours subject; B- or better overall). The applicant must also be recommended by the department in which he/she plans to undertake his/her studies.

Applicants for a master's degree who have a program requirement for 7.0 credits or less will register directly in the master's program.

## 2.5 Doctoral Program

For admission to the Ph.D. program, applicants must ordinarily hold a master's degree, or the equivalent, from a recognized university, normally with an average of B+ or better in courses (including thesis where applicable) and normally with no grade below B-.

## 2.6 Restriction on Degrees

Applicants should note that, while Carleton University does not restrict the number of degrees (bachelor's, master's, Ph.D.) that may be taken in any one discipline, some departments and schools may restrict the number to two.

## 2.7 Certificate Program

For admission to the certificate programs, applicants are advised to consult with the individual departments offering the certificate.

## 3. Application for Admission

### 3.1 Senate Policy Statement on Accessibility for the Disabled

Carleton University is committed to making reasonable accommodation to individuals with disabilities and actively encourages application from disabled students. This commitment includes gaining an understanding of the circumstances of an individual's disabilities and to adjusting services to all academically qualified individuals enabling them to compete on an equitable basis.

Students are encouraged to contact the Paul Menton Centre for Persons with Disabilities for further information to enable them to assess the extent to which specialized services will be available.

Academic accessibility is intrinsically linked to physical accessibility. Carleton is committed to continually monitoring and upgrading physical accessibility to whatever extent is possible.

A Standing Committee of Senate monitors the needs and problems of disabled students in

conjunction with their academic problems and makes recommendations for improvements.

(See General Information, Student Life Services, Persons with Disabilities, p.23).

## 3.2 Application Forms

Applications for admission to the Faculty of Graduate Studies and Research should be made on prescribed forms, available from the major department or the office of the Faculty of Graduate Studies and Research, and they should be submitted directly to the department. To cover administrative costs, a non-refundable charge of \$35 (Cdn. or U.S. funds) is required with each application.

## 3.3 Deadlines

The Faculty of Graduate Studies and Research normally admits students to commence in the fall term. However, some academic units may consider applicants to commence in the winter term or the spring/summer term. Applications for admission may be submitted at any time. Applications for admission from outside Canada should be completed at least five months before the desired date of admission in order for students to make the necessary visa arrangements.

Applicants wishing to be considered for financial assistance from Carleton University are reminded that they must submit their completed applications before March 1. Please note that some schools and departments may require completed applications prior to March 1. Students should refer to departmental entries in this Calendar for details.

Students applying to joint programs with the University of Ottawa should note that application procedures, especially deadlines, are different in the two institutions, and they should refer to the university calendars for details.

## 3.4 Transcripts

Two detailed *official* transcripts of the applicant's entire university record must be sent to the chair of the department concerned. All foreign documents, e.g., transcripts, must be translated into English and be notarized.

## 3.5 Letters of Reference

All applications must be supported by letters of recommendation from at least two faculty members with whom the candidate has studied, who are in a position to assess his/her potential for graduate studies and research. References from non-academic supervisors are not ordinarily acceptable, except in certain cases, such as that of an applicant working in a research laboratory environment. All letters of reference are to be sent by the referees directly to the chair of the department.

### 3.6 Proficiency in English

Proficiency in English is necessary to pursue graduate studies at Carleton

University. All applicants whose first language is not English must satisfy this requirement in one of the following ways:

- (i) certification that the language of instruction in their most recently completed undergraduate or graduate degree was English; or
- (ii) an overall score of 60 or better on the Carleton Academic English Language Assessment with a minimum score of 60 for the writing section (some programs may require a higher standard of performance); or
- (iii) a TOEFL score of 550 or better (some programs may require a higher standard of performance).

## 4. Admissions Procedure

### 4.1 General Procedure

All applicants for admission will initially be examined and evaluated by the department, institute, or school in which the applicant wishes to study. All supporting documents (transcripts, letters of reference, etc.) must be received before any application can receive formal consideration.

Completed applications of those students whom the department wishes to recommend for admission will be forwarded to the Dean of the Faculty of Graduate Studies and Research for consideration. The office of the Dean will officially notify each applicant whose admission is approved.

### 4.2 Admission Validity for New Students

The Statement of Standing on Admission issued to each newly-admitted student is valid only for the twelve month period stipulated on the form. If the applicant fails to register within this period of time, his/her admission and registration eligibility will lapse automatically. He/she may re-apply for admission.

### 4.3 Revocation of Admission or Registration

The University may nullify an admission and revoke a registration if it finds that an applicant for admission or registration has, in the process, provided false or incomplete information.

## 5. Program Requirements

### 5.1 General Information

A description of each program offered under the auspices of the Faculty of Graduate Studies and Research is presented in the departmental Program Descriptions and Details of Courses section of this Calendar. Prospective applicants should note particularly the admission requirements, the fields in which advanced study and research may be undertaken, and the program requirements of each department, in addition to the general regulations of the Faculty of Graduate Studies and Research, which are spelled out in this section.

### 5.2 Qualifying-Year Program

Students in the qualifying year will ordinarily register in 5.0 credits, at the senior undergraduate level. Of these five, normally no more than 1.0 credit at the 200-level and no more than 2.0 credits at the 500-level may be taken.

### 5.3 Master's Program

The normal requirement for the master's degree is 5.0 credits, of which at least 4.0 (including the thesis where applicable) must be at the 500-level. With departmental approval, the remaining 1.0 credit may be selected from those offered at the senior undergraduate level, that is, at the 400-level.

Where applicable, the normal requirement for a 10.0 credit master's degree is 10.0 credits, of which at least 8.0 credits (including the thesis where applicable) must be at the 500-level. With departmental approval, the remaining 2.0 credits may be selected from those offered at the senior undergraduate level, that is, at the 400-level.

### 5.4 Doctoral Program

Ordinarily, all courses taken for credit towards the Ph.D. degree must be at the 500- or 600-level.

The thesis will ordinarily carry a weight of about half of the total requirement of 10.0 credits.

### 5.5 Language Requirements

Some graduate programs require a reading knowledge of one or more languages other than English. Language requirements will be prescribed by departments according to their regulations and the needs of their students. Language requirements must be completed within the time limit allowed for the completion of the student's program.

## 6. Transfer of Credit

### 6.1 Transfer of Credit on Admission

Graduate courses completed at another institution or at Carleton University may be accepted in partial fulfillment of Carleton's degree requirements. Credit for such work will be determined in each case by the Faculty of Graduate Studies and Research on the recommendation of the department concerned. Master's candidates in a 5.0 credit program are allowed a maximum of 2.0 transferred credits. In addition, if a master's candidate is granted transfer of credit for 2.0 credits, his/her remaining 3.0 credits at Carleton must be at the 500-level.

Master's candidates enrolled in programs other than 5.0 credits will be permitted to transfer the equivalent up to but no more than 40 percent of their program credit requirements on admission. In addition, if a master's candidate is granted transfer of credit for 2.0 credits, his/her remaining 3.0 credits at Carleton must be at the 500-level.

Doctoral candidates may be given up to one year's credit for work completed at other universities but must normally register for a minimum of one year of full-time studies thereafter at Carleton and fulfill the thesis and comprehensive examination requirements. Students admitted with transfer of credits in a Ph.D. program may be required to pass a qualifying examination upon entry.

A candidate who has completed credits as a special student is not normally permitted to transfer such credits for degree credit in the Faculty of Graduate Studies and Research.

Special students enrolled in a graduate level course are subject to the special student regulations outlined in the *Undergraduate Calendar*.

### 6.2 Transfer of Credit After Admission

A student formally admitted to and eligible to register in a graduate program is not permitted to register at Carleton University at the same time in any other graduate program or as an undergraduate or special student. Should he/she do so, credits may not be transferred.

Similarly, if a student normally admitted to a graduate program at Carleton wishes to enroll in courses at another university, credit will be granted only if written permission is received from the Dean of the Faculty of Graduate Studies and Research. Such permission must be received in advance of registration for the course work. *In no case will such transfer alter the maximum number of allowable transferred credits noted above.*

## 7. Registration and Course Selection

### 7.1 The Calendar Year

The Faculty of Graduate Studies and Research divides the calendar year into three terms, and the academic year (September-May) into two terms; each term comprises about thirteen weeks of lectures or seminars. The first term of the academic year is designated as the *Fall term* (registration period at the beginning of September); the second term of the academic year is designated as the *Winter term* (registration period early in January); and the third term of the calendar year is designated as the *Spring/Summer term* (registration period in early May). The precise dates of registration for the Fall, Winter, and Spring/Summer terms are specified in the academic schedule (see p.11).

### 7.2 Course/Program Approval

Graduate students must have approval from their departmental supervisor of graduate studies for initial course/program registration, and for any subsequent course changes. This approval is also required for any undergraduate student who wishes to register in a graduate-level course.

Credit will be granted only for those courses and research activities for which the candidate is formally registered. An unregistered student is not entitled to attend lectures, tutorials, or seminars, and is not entitled to thesis supervision, examination privileges, or access to research facilities. A student will receive no credit for any work completed during a term in which he/she was not properly registered.

### 7.3 Student Records Information

#### Names

As the University is committed to the integrity of its student records, each student is required to provide on the application for admission his/her complete, legal name. Any requests to change a name, by means of alteration, deletion, substitution, or addition, must be accompanied by appropriate supporting documentation. Upon making application for graduation, students may be asked to provide proof of their name.

#### Addresses

Incorrect address information will delay the receipt of awards and student information. Students must notify the office of the Faculty of Graduate Studies and Research immediately of any change in:

\* permanent or home address (used for registration information)

\* local address (used for all mail during the academic session)

\* telephone number for permanent address and for local address

## 7.4 Revocation of Registration/Admission

The University may nullify an admission and revoke a registration if it finds that an applicant for admission or registration has, in the process, provided false or incomplete information.

## 7.5 Course Selection

A student proceeding to a graduate degree, diploma, or certificate must arrange his/her program according to the regulations of the Faculty of Graduate Studies and Research and the major department.

The course and thesis requirements of each graduate program are organized or defined in units of credits: 1.0 credit typically comprises three hours of lectures or seminars a week for two terms, or the equivalent; 0.5 credit typically comprises three hours of lectures or seminars a week for one term, or the equivalent.

## 7.6 Evaluation

To gain standing in a course, a student must meet the course requirements for attendance, term work, and examinations. Instructors will inform their classes by distributing written notices, before the last day for late registration, of the elements and their weighting that will contribute to the final grade, including (where applicable) attendance, class participation, essays, tests, laboratories, studio-workshops, other course-related work assignments, and final examinations.

## 7.7 Tutorials

These are arranged to allow students to take full advantage of all the resources of the University, even in areas or fields of a very highly specialized nature. Such arrangements are subject to the approval of the supervisor of graduate studies, who will arrange that a document spelling out the details of the topic, reading list, etc., is submitted to the office of the Faculty of Graduate Studies and Research before the last day for course changes in the term concerned.

## 7.8 Audit Course

Graduate students may register to audit 1.0 credit per program.

\* Full-time students will not be charged an additional fee; others must pay the prevailing fee for part-time students.

\* Part-time students will not be permitted to audit a course in addition to two 0.5 credits per term.

## 7.9 Course Numbering System

Each course is identified by a seven-symbol code. The first two digits indicate the department, school, or committee under whose auspices the course is offered. The three digits following the decimal point identify the specific course. The letter which follows the course number designates the term in which the course is offered: F denotes Fall term; W, Winter term; S, Spring/Summer term; and T, two terms (Fall and Winter). The number which follows the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

## 7.10 Status

### *Prior to May 1, 1996*

All students admitted and registered prior to May 1, 1996 are reminded that status is established by formal registration in the appropriate courses for each term of activity in the calendar year. Those students registering solely in a thesis, research essay, or independent research project will declare whether their status is full time or part time according to the definition in 7.11 and 7.12.

### *Important Note*

All students in this category will be eligible for post-residency fee rates for the duration of their program unless:

- (i) a re-admission is required because the time for completion of degree has expired
- (ii) a new admission is required in cases of an approved degree transfer or new degree admission.

In the cases noted above, students will lose their grandparent fee status and will be subject to the current fee rates, i.e., the same fee rates that apply to students initially registered and admitted after May 1, 1996.

### *After 1 May 1996*

All students admitted and registered after May 1, 1996 should note:

(i) the elimination of post-residency status and fee rates associated with post-residency for all admitted graduate degree students. Post-residency is defined as those students in the second or subsequent year of full-time study in a master's program; third or subsequent year of full-time study in the School of Public Administration, School of Journalism and Communication, or School of Social Work; and third or subsequent year of full-time study in a Ph.D. program.

(ii) that full- or part-time status is established by admission status and initial program registration. Graduate students admitted and registered after May 1, 1996 who apply and are admitted as full-time students and who initially register as full-time students will be required to

continue and complete their program as full-time students, and will be assessed full-time fees for the duration of their program; graduate students admitted and registered after May 1, 1996 who apply and are admitted as part-time students and who initially register as part-time students will be required to continue and complete their program as part-time students, and will be assessed part-time fees for the duration of their program.

### 7.11 Definition of Full-Time Status

*Full-time course load for all students (admitted and registered prior to and after May 1, 1996)*

A full-time graduate student will normally register in a minimum of 1.5 credits per term. An audit is not permitted as part of the 1.5 credits required per term to maintain full-time status.

In addition to the course load requirements described above, the following criteria for full-time status have been established by the Faculty of Graduate Studies and Research for all students (admitted and registered prior to and after May 1, 1996).

A full-time graduate student must:

- (i) identify himself or herself at the point of first registration as a full-time graduate student
- (ii) be considered a full-time graduate student by his or her supervisor
- (iii) be designated as a full-time graduate student by the University

Students who are unsure of their status should contact the office of the Faculty of Graduate Studies and Research for assistance, at 520-2525.

### 7.12 Definition of Part-Time Status

*Part-time course load for all students (admitted and registered prior to and after May 1, 1996)*

A part-time graduate student will normally register in a maximum of 1.0 credit per term, including audit courses.

In addition to the course load restriction described above, the following criteria for part-time status have been established by the Faculty of Graduate Studies and Research for all students (admitted and registered prior to and after May 1, 1996).

A part-time graduate student must:

- (i) identify himself or herself at the point of first registration as a part-time graduate student
- (ii) be considered a part-time graduate student by his or her supervisor
- (iii) be designated as a part-time graduate student by the University

### 7.13 Change of Status from Full-Time to Part-Time

Students who have valid reasons for changing status from full-time to part-time for a term may apply for permission by:

- \* writing to the Dean of the Faculty of Graduate Studies and Research stating the reason(s) for seeking exemption from the full-time registration requirements stated in 7.10 and 7.11

- \* requesting a statement from the departmental graduate supervisor (and the thesis supervisor if there is one) in support of their request, confirming that they will be infrequently on campus for the term, will be using the University facilities (i.e., library, laboratories, computer centre, etc.) on a part-time basis, and will be receiving supervision on a part-time basis, including supervision through correspondence

It is understood that such a status change will be granted only in exceptional cases (e.g., for medical or other special reasons.)

Exemptions are normally granted for a term, but, in extraordinary circumstances, approval may be granted for a longer period.

### 7.14 Off-Campus Research

In the interest of enriching their learning experience, graduate students may arrange to undertake full-time studies or research at another institution or in the field. It should be understood that such activity would apply to only a part of the total program and that the off-campus period would not normally exceed twelve months.

Requests for permission to undertake full-time off-campus study or research must be submitted, well in advance, to the Dean of the Faculty of Graduate Studies and Research through the department concerned. Such requests should include the following information:

- \* a detailed statement of the research proposal or program of studies, and the specific arrangements that are proposed for the supervision and direction of the work

- \* an explanation of the reasons why the work cannot be satisfactorily undertaken while on campus at Carleton University

- \* a description of the studies and/or research facilities that are available at the proposed off-campus location

- \* a written statement from a responsible official (for example, the on-site supervisor or director) of the outside institution confirming that the proposed arrangements are satisfactory and that the candidate will be able to undertake research or studies

- \* a time schedule for the proposed studies or research work

\* a statement of the candidate's expected sources of financial support

## 7.15 Inter-University Cooperation in Graduate Instruction

Under certain circumstances, it is permissible for a student admitted to a graduate degree program and registered at one Ontario university to follow an approved credit course at another university. All interested students should consult the chair of their department, prior to registration, in order to obtain further information on procedures and conditions of eligibility. In order for this procedure to be valid, students must be officially registered at their home institution by contacting the office of the Faculty of Graduate Studies and Research.

## 7.16 University of Ottawa

Carleton University and the University of Ottawa have developed a number of joint programs at the graduate level. The details of these are given under the appropriate academic unit later in this Calendar.

Where formal joint programs do not exist, a graduate student may be permitted to follow up to 2.0 credits at the University of Ottawa. Moreover, there are reciprocal arrangements worked out among departments, institutes, and schools at both universities to involve students, when it is desirable, in parts of the program of research and studies at the other institution. All interested students should consult the chair of their department, institute, or school, prior to registration, in order to obtain further information on particular departmental conditions of eligibility and procedures. In order for this procedure to be valid, students must be officially registered at their home institution by contacting the office of the Faculty of Graduate Studies and Research.

## 8. Continuous Registration

### 8.1 Loss of Status

Any candidate who remains unregistered in his/her degree program for three terms (twelve months) will lose his/her graduate status.

### 8.2 Continuous Registration in Thesis, Research Essay, or Independent Research Project

Any candidate (full-time or part-time), after initial registration in a thesis, research essay, or independent research project, must maintain this registration in all successive terms (including the term in which the student is examined) until his/her thesis, research essay, or independent research project is completed. Completion means modifications, any retyping involved, etc. Students should note that faculty approval

to register in the thesis, etc., is given on the understanding that the student will be in regular contact with his/her supervisor, and that thesis research will be actively pursued in each term of registration.

### 8.3 Deposit of Thesis Copies

In the case of a thesis, registration must be maintained until five final copies are deposited in the office of the Faculty of Graduate Studies and Research. Should the final copies not be deposited in the office of the Faculty of Graduate Studies and Research by the last day for late registration in a given term, the student will be required to register for that term.

### 8.4 Reinstatement

Students whose files have been closed as a result of failure to observe continuous registration requirements must apply for reinstatement if they wish to continue their studies. If reinstated, students must pay a reinstatement charge which consists of \$50 *plus the equivalent of 1.0 credit tuition fees for each term in which they failed to register.*

The reinstatement charge is a tuition fee and therefore is defined as eligible for income tax deduction.

### 8.5 Exemption from Registration

Students who have valid reasons for not registering for a term may apply for permission to remain unregistered by:

- \* writing to the Dean of the Faculty of Graduate Studies and Research stating the reasons for seeking exemption from registration
- \* requesting a statement from the departmental supervisor of graduate studies (and from their thesis supervisor, if there is one) in support of their request, confirming that they will not be on campus for the term, will not use any University facilities (that is, library, laboratories, computer centre, etc.), or receive any supervision, including supervision through correspondence
- \* applying to the Dean of the Faculty of Graduate Studies and Research through their graduate department for a one- to three-term maternity leave during their program of study. While on leave students will not be registered with the faculty, nor will they be required to pay fees for this period. They will not be eligible to receive awards administered by Carleton University during the leave. In the case of other awards, the regulations of the particular granting agency will apply. The time limit for completion of the program will be extended by the duration of the leave taken. Where possible, the start and finish of the leave should coincide with the start and end of a term.

A charge of \$50 per term for leave of absence must accompany each request.

It is understood that such an exemption from registration will be granted only in exceptional cases (for example, medical or other special reasons).

Exemptions are normally granted for one term, but in extraordinary circumstances an exemption may be granted for a longer period.

When exemption from registration for a term or terms has been approved by the Dean of the Faculty of Graduate Studies and Research, this period will be exempt from the overall time limit allowed for completion of the program.

### 8.6 Off-Campus Registration

Students who have been permitted to study off campus while registered full-time at Carleton, may register using Touchtone Telephone Registration.

### 8.7 Course Changes

A course change is the addition or deletion of one or more individual courses by a registered graduate student. This is the only acceptable procedure for revising or correcting a graduate student's registration. All course changes must be approved by the student's department.

Note: The deadline dates for course changes are stipulated in the academic schedule of this Calendar.

### 8.8 Withdrawal

A graduate student wishing to terminate his/her registration in a graduate program (that is, drop all courses) must consult with his/her department prior to withdrawal.

#### \* *Withdrawal Credit*

When a student officially withdraws, a withdrawal credit will be calculated on a *pro rata* basis as of the date of withdrawal or receipt of letter. Credit for fees or refunds will depend on the date of withdrawal and the amount of fees originally paid. Students are encouraged to examine the financial implications of withdrawal. A refund schedule is available at the Business Office

#### \* *Mid-Term Transfer of Program*

Graduate students are cautioned that there is no procedure at Carleton University for direct "mid-term" transfer from one graduate program to another. Similarly, there can be no direct transfer to or from undergraduate or special student status. Any candidate who elects to change programs after registration (before the last day of late registration) will be required to withdraw from the first program and then register in the second. The *pro rata* refund of fees

calculated as a result of withdrawal from the first program can be applied against the new fee assessment for the second program.

#### \* *Degree Completion*

A registered candidate who completes his/her degree requirements by depositing the thesis/research essay prior to the last day for withdrawal in any term (as specified in the academic schedule) is required to withdraw formally if he/she anticipates any refund of fees.

Note: This only applies to thesis or research essay registration.

## 9. Examinations

### 9.1 General Remarks

Final examinations in courses will be held at the times indicated in the academic schedule. Graduate students must obtain grades that meet the standards outlined in Section 11, Academic Standing and that satisfy the specific requirements of the department concerned.

### 9.2 Special/Deferred Final Examinations

A graduate student who is unable to write a final examination because of illness or other circumstances beyond his/her control, or whose performance on the examination has been impaired by such circumstances, may apply to write a special or deferred final examination. Such an application will be considered only if it is submitted in writing to the Dean of the Faculty of Graduate Studies and Research within two weeks of the examination.

If the student has been seen at the University Health Services, the office of the Dean will confirm the illness by contacting the treating physician. If the student has consulted a physician outside the University, he/she will be required to submit a statement from the physician confirming the illness.

In cases other than illness, appropriate documents will be required.

Students with special needs may also apply for special/deferred final examinations by contacting the Faculty of Graduate Studies and Research.

### 9.3 Master's Examinations and Deadlines

In addition to any examination which may be required in individual courses, a master's candidate who is writing a thesis will be expected to undertake either an oral defence of the thesis or a comprehensive examination in his/her field of specialization, or both. Please refer to Thesis Specifications, Section 12.5, Master's,

for submission deadlines. When the degree is taken by course work, a comprehensive examination may be required. It is important to note that individual departments may have additional or particular requirements.

Some departments specify deadlines for the submission of thesis proposals and for comprehensive examinations. Students should check the Calendar entry for their department.

## 9.4 Doctoral Examinations and Deadlines

Doctoral candidates may be asked to pass a qualifying examination at the beginning of their residence at Carleton University.

A comprehensive examination covering prescribed fields will normally be undertaken one year prior to the thesis presentation. This examination (oral or written, or both) may include any material considered fundamental to a proper comprehension of the field of study.

After the thesis has been received and accepted for examination, a final oral examination on the subject of the thesis and related fields will be held. Please refer to Thesis Specifications, Section 12.5, Doctoral, for submission deadlines.

Some departments specify deadlines for the submission of thesis proposals and for comprehensive examinations. Students should check the Calendar entry for their department.

## 9.5 Comprehensive Examinations

The date, place, and time of comprehensive examinations will be announced at least two weeks in advance. An examining board will be appointed according to the guidelines laid down by the Faculty of Graduate Studies and Research.

## 9.6 Unsatisfactory Grades

If the comprehensive examination is graded *Unsatisfactory*, the department may permit the candidate to repeat the examination. If the comprehensive examination is graded *Unsatisfactory* for a second time, a request by the department that the candidate be allowed to continue in the program would require the approval of the Faculty of Graduate Studies and Research.

The comprehensive and thesis examination processes must be conducted according to the principles and practices prescribed by the Faculty of Graduate Studies and Research.

## 10. Grading System

### 10.1 Letter Grades

Carleton University employs the twelve-point

system of letter grades to represent standing in graduate lecture courses, directed studies, seminars, tutorials, and some research essays. The letter grades used and the grade point equivalents are as follows:

A+	12	B+	9
A	11	B	8
A-	10	B-	7
C+	6	D+	3
C	5	D	2
C-	4	D-	1

The following percentage equivalents apply to all final grades at Carleton.

A+	90-100	B+	77-79
A	85-89	B	73-76
A-	80-84	B-	70-72
C+	67-69	D+	57-59
C	63-66	D	53-56
C-	60-62	D-	50-52

### 10.2 Other Grading Notations

Under certain defined circumstances, notations are used instead of letter grades to represent standing. The only notations permissible in the Faculty of Graduate Studies and Research are the following:

\* a notation of *Satisfactory* or *Unsatisfactory* may be assigned, subject to the approval of the Faculty of Graduate Studies and Research, in certain very special courses involving practicum, field work, or other complex activities not easily adaptable to the twelve-point system of grading

\* comprehensive examinations are graded *Pass With Distinction*, *Satisfactory*, or *Unsatisfactory*

\* the master's thesis is graded *Pass With Distinction*, *Satisfactory*, or *Unsatisfactory*. The oral defence is graded *Satisfactory* or *Unsatisfactory*

\* the Ph.D. thesis and its oral defence are each graded *Satisfactory* or *Unsatisfactory*

\* a notation of *Incomplete* may, subject to the approval of the chair of the department, be assigned to a course in which the student has been granted the privilege of submitting an assignment after the final deadline date. This notation of *Incomplete* will be permissible only in exceptional cases (for example, medical or other special reasons) and must be replaced with a letter grade within forty days of the end of classes. If the notation of *Incomplete* is not

changed to a letter grade (through the regular change-of-grade procedures) within *forty* days of the end of classes, the *Incomplete* notation will be changed to a grade of F, which will remain as a permanent entry on the student's record. In exceptional cases students may petition the Dean of the Faculty of Graduate Studies and Research to have the *Incomplete* notation remain on the student record. With the permission of the Dean of the Faculty of Graduate Studies and Research, students may register to repeat the course in order to obtain a letter grade. In the circumstances that go beyond the *forty* day period (for example, medical or other special reasons), students may apply for a deferral (refer to Special/Deferred Final Examinations, Section 9.3)

\* *Fail*: a notation of F will be assigned to any course in which the student has failed

\* a notation of *Absent* will be assigned to any course in which the student failed to attend the final examination. If the student explains his/her absence (in writing) to the Dean of the Faculty of Graduate Studies and Research within *fourteen* days of that examination, he/she may be granted the privilege of undertaking a special or deferred examination. The notation of *Absent* will also be assigned where a student has terminated a course without formally withdrawing from the course prior to the end of classes; this notation is deemed to be the equivalent of a failure

\* if a thesis, research essay, independent research project, or comprehensive examination is not completed by the end of the period of registration, the notation of *In Progress* will be recorded. The notation *In Progress* may, subject to the approval of the Faculty of Graduate Studies and Research, be used for a research seminar, i.e., a seminar in which students present the results of their thesis research. This notation must be replaced by an appropriate final notation or grade (as specified above) after the thesis, research essay, independent research project, or research seminar has been examined. In cases where a student has registered in a research essay or a thesis without completing it and later undertakes course work to complete the degree program, or loses graduate student status in the program, the notation *In Progress* will remain as a permanent entry on the student's record.

### 10.3 Release of Grades

Grades can be accessed through the Touchtone Telephone System for each student as soon as the grades are available after the end of the fall and winter terms of the Fall/Winter session and after the end of the spring session. Transcripts required for professional and graduate schools should be ordered well in advance of any deadline set by these institutions. Students are advised that no official transcripts will be released

by the University until all outstanding accounts due have been paid.

## 11. Academic Standing

### 11.1 Qualifying-Year Program

Students should note that admission to the master's program from qualifying year is governed by the admission requirements in Section 2, Admission Requirements and Eligibility.

### 11.2 Master's Program

A grade of *B-* or better must normally be obtained in each course credited towards the master's degree. A candidate may, with the recommendation of his/her department and the approval of the Dean of the Faculty of Graduate Studies and Research, be allowed a grade of *C+* in 1.0 credit. Some departments do not permit the *C+* option; students should check carefully to see if the department in question has a *B-* minimum rule.

#### \* Full-Time Continuation

Full-time master's candidates who fail to achieve a weighted GPA of 7.0 after two terms of study, or to maintain it subsequently, will be required to withdraw from the program. In the event of special or extenuating circumstances, the student may apply to the Dean of the Faculty of Graduate Studies and Research for permission to continue in the program.

#### \* Part-Time Continuation

A part-time master's student who fails to achieve or maintain a weighted GPA of 7.0 after completing 2.0 credits will be required to withdraw from the program.

### 11.3 Doctoral Program

Doctoral students must normally obtain a grade of *B-* or better in each course credited towards the degree.

### 11.4 Departmental Evaluation

In addition to the above requirements, departments will undertake a periodic evaluation of a student's progress in his or her overall program of studies and research to determine whether that progress is satisfactory. In the event that progress is deemed unsatisfactory, the department may recommend to the Dean of the Faculty of Graduate Studies and Research that the student be required to withdraw.

### 11.5 Religious Accommodation

Carleton University accommodates students who, by reason of religious obligation, must miss an examination, test, assignment deadline, laboratory, or other compulsory event.

Accommodation will be worked out directly and on an individual basis between the student and the instructor(s) involved. Students should make a formal request to the instructor(s) in writing for alternative dates and/or means of satisfying requirements. Such requests should be made during the first two weeks of any given academic term\*, or as soon as possible after a need for accommodation is known to exist, but in no case later than the penultimate week of classes in that term. Instructors will make reasonable accommodation in a way that shall avoid academic disadvantage to the student.

Students unable to reach a satisfactory arrangement with their instructor(s) should contact the Director of Equity Services. Instructors who have questions or wish to verify the nature of the religious event or practice involved should also contact this officer.

\*When a student's presence is required prior to the date on which classes begin (e.g. For field trips or Orientation activities) any student who cannot meet this expectation of attendance for reasons of religious accommodation should notify the appropriate Faculty Registrarial Services Office in advance.

## 12. Thesis Requirements

Guidelines for the preparation of graduate theses and information on the procedures for examination of graduate theses are available on the World Wide Web at: [www.carleton.ca](http://www.carleton.ca). This information is also available in the Graduate Student Handbook which is produced jointly by the Faculty of Graduate Studies and Research and the Graduate Students' Association.

### 12.1 General Remarks

The thesis is a major requirement of most programs and, in conjunction with the research for it, makes up at least one half of the time normally required for the program. The thesis must be expressed in a satisfactory literary form, consistent with the discipline concerned, and must display a scholarly approach to the subject and thorough knowledge of it. A critical review of previous work related to the subject should usually be given.

A candidate will not be permitted to submit a thesis for which he or she has previously received a degree; however, with the permission of the Dean of the Faculty of Graduate Studies and Research, he or she may incorporate into the thesis material that was included in a previous thesis.

### 12.2 Master's Thesis

The master's thesis should embody the results of successful scholarly research in a special-

ized area. It should exhibit the candidate's knowledge of recognized techniques of investigation and critical evaluation, and be presented in an organized and systematic way.

#### \* Oral Examinations

Candidates are ordinarily required to undertake an oral examination of the thesis. Please refer to Thesis Specifications, Section 12.5, Master's, for submission deadlines. The master's thesis will be examined by a board consisting of at least four members, including the thesis supervisor, the chair of the department concerned, an examiner from a department other than that of the candidate, and one additional member from the department concerned. The chair of the department concerned will announce the constitution of the examining board; both it and the thesis examination process are defined by guidelines, principles, and practices prescribed by the Faculty of Graduate Studies and Research.

#### \* Thesis Weight

Thesis weight (1.0 to 3.0 credits) must be identified at the time of admission. A change in the thesis weight at a later date would require the approval of the Dean of the Faculty of Graduate Studies and Research.

#### \* Research Essays and Independent Research Projects

Faculty regulations governing research essays and independent research projects are normally the same as those for master's theses, and subject to the guidelines, principles, and practices prescribed by the Faculty of Graduate Studies and Research.

### 12.3 Doctoral Thesis

The doctoral dissertation must report, in an organized and scholarly fashion, the results of original research. The thesis must be a contribution to knowledge, and must demonstrate the candidate's ability to undertake sustained research and to present his/her findings in an appropriate manner.

#### \* Oral Examinations

The thesis must be defended successfully at an oral examination. Please refer to Thesis Specifications, Section 12.5, Doctoral, for submission deadlines. The doctoral thesis will be examined by a board consisting of at least five members, including the thesis supervisor, the chair of the department concerned, an examiner from a department other than that of the candidate, the members of the candidate's advisory committee, the Dean of the Faculty of Graduate Studies and Research or his delegate, and an external examiner who is a recognized authority on the subject of the thesis.

The Dean of the Faculty of Graduate Studies and Research will announce the constitution of

the examining board; both it and the thesis examination process are defined by guidelines, principles, and practices prescribed by the Faculty of Graduate Studies and Research.

*\* Thesis Weight*

Thesis weight (ordinarily about half of the total Ph.D. requirements of 10.0 credits) must be identified at the time of admission. If the thesis weight falls within a range of credit weights, it should be assigned at the time of admission a weight corresponding to the lower bounds of that range. A change in the thesis weight at a later date would require the approval of the Dean of the Faculty of Graduate Studies and Research. The work of each Ph.D. candidate will be assisted by an advisory committee of faculty members who will aid the candidate in his/her preparation for the final comprehensive examination, and assist in the evaluation of the thesis and oral examinations.

## 12.4 Deadlines

*\* Master's Thesis*

A master's student expecting to graduate at the Spring Convocation must submit his/her thesis to his/her supervisor, in examinable form, by *March 1*. A master's student expecting to graduate at the Fall Convocation must submit his/her thesis by *August 1*. A master's student expecting to graduate at the Winter Graduation must submit his/her thesis by *December 1*.

*\* Doctoral Thesis*

A Ph.D. student expecting to graduate at the Spring Convocation must submit his/her thesis to his/her supervisor, in examinable form, by *March 1*. A Ph.D. student expecting to graduate at the Fall Convocation must submit his/her thesis by *August 1*. A Ph.D. student expecting to graduate at the Winter Graduation must submit his/her thesis by *December 1*.

## 12.5 Specifications

\* The candidate must submit six printed copies (original and five acceptable duplicated copies, on bond paper) and must comply with the special departmental requirements governing the form of the thesis, including methods of bibliographical entry and the use of diagrams and tables.

\* Each thesis must be accompanied by a suitable abstract. The abstract of a master's thesis should not exceed 150 words, while the abstract of a doctoral thesis may be up to 350 words in length.

\* Regulations regarding style, pagination, certification, acceptance, grade and size of paper, as well as abstracts, reproduction, micro-filming, binding, and the constitution of the examining board will be prescribed by the Faculty of Graduate Studies and Research.

*\* Master's Thesis*

The candidate is expected to notify his/her supervisor and the chair of the department at least two weeks in advance of the date on which he/she intends to submit the completed thesis. The candidate is then expected to submit six copies of the completed thesis to the department at least four weeks in advance of the intended date of examination. The thesis examination and defence will then be scheduled and the date will be announced at least two weeks in advance. The department must deposit one copy of the thesis to the office of the Faculty of Graduate Studies and Research at least two weeks in advance of the actual date for the examination and defence.

*\* Doctoral Thesis*

The candidate is expected to notify his/her supervisor and the chair of the department at least two weeks in advance of the date on which he/she intends to submit the completed thesis. The candidate is then expected to submit six copies of the completed thesis to the department at least six weeks in advance of the intended date of examination. The thesis examination and defence will then be scheduled and the date will be announced by the Dean of the Faculty of Graduate Studies and Research at least four weeks in advance. The department must deposit one copy of the thesis to the office of the Faculty of Graduate Studies and Research at least four weeks in advance of the actual date for the examination and defence.

\* Five unbound copies of the approved thesis, the original and four others, should be submitted for binding to the Faculty of Graduate Studies and Research. Each copy must be presented in order of pagination in a separate envelope. Two copies are maintained in the library, the third copy is given to the department, the fourth copy is for the candidate, and the fifth copy is for the thesis supervisor. If the thesis was supervised by two faculty members, the Faculty of Graduate Studies and Research will accept six unbound copies.

## 12.6 Licence to the University and to the National Library of Canada

In the interest of facilitating research by members of the Carleton community and by interested outsiders, and in consideration of his/her having been accepted as a graduate student at Carleton, the student author of a thesis or dissertation submitted in partial fulfillment of the requirements for an advanced degree shall grant to the University and to the National Library of Canada a license to make single copies or microfilms, solely for the purpose of private study and research, in response to written requests from individuals, libraries, universities, or similar institutions.

It is understood that the student author retains other publication rights, and that neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

## 12.7 Withholding of Thesis Deposition

If, at the time of submitting his/her thesis, the student elects to protect any rights to immediate commercial publication, or to obtain a patent which may arise from his/her research, or to keep his/her thesis out of circulation for other reasons, he/she may apply in writing to the Dean of the Faculty of Graduate Studies and Research requesting that the thesis be withheld from deposit in the library:

\* for an additional period of three months, without reason

\* for each additional period of six months, with reason (total period of restriction not to exceed two years)

The student must submit any request for extension of the restriction one month prior to the termination of the previous period. The student and his/her supervisor will be required to justify the extension of the restriction. Subsequent requests must follow the same procedure.

## 13. Time Limits for Program Completion

### 13.1 General Remarks

There are maximum time limits for the completion of programs. Candidates may also be subject to time constraints prescribed by individual departments to ensure orderly progress through the stages of their programs.

### 13.2 Master's Program

#### \* Full time

Full-time master's candidates must complete their degree requirements within six terms of registered full-time study. Students admitted to a 10.0 credit master's program (that is, in the School of Public Administration, the School of Journalism and Communication, and the School of Social Work) must complete their degree requirements within nine terms of registered full-time study.

#### \* Part time

A part-time master's candidate must complete his/her degree requirements within an elapsed period of six calendar years after the date of initial registration. Students admitted to a 10.0 credit master's program (that is, in the School of Public Administration, the School of Journalism and Communication, and the School of

Social Work) must complete their degree requirements within an elapsed period of eight calendar years after the date of initial registration.

#### \* Combined Full Time and Part Time

A master's candidate who elects to complete his/her program by a combination of full-time and part-time study is governed by the following elapsed-time limitations: five calendar years if the candidate is registered as a full-time student for two or three terms and part-time for the balance; four calendar years if the candidate is registered for four or five terms as a full-time student and part-time for the balance.

These limitations are calculated from the date of initial registration in the master's program.

*\* Combined Full-Time and Part-Time in 10.0 credit Master's Programs in the School of Public Administration, the School of Journalism and Communication, and the School of Social Work*

A master's candidate who elects to complete his/her program by a combination of full-time and part-time study must complete the degree requirements within an elapsed period of eight calendar years after the date of initial registration in the master's program.

### 13.3 Doctoral Program

#### \* Full Time

A full-time Ph.D. candidate who is admitted on the basis of a master's degree (that is, with a program of 10.0 credits or the equivalent) must complete the Ph.D. degree requirements within an elapsed period of six calendar years after the date of initial Ph.D. registration.

#### \* Part Time

A Ph.D. candidate who undertakes the program by a combination of full-time and part-time study must complete the degree requirements within an elapsed period of eight calendar years after the date of initial registration in the Ph.D. program.

### 13.4 Exemption from Time Limit

When exemption from registration for a term or terms has been approved by the Dean of the Faculty of Graduate Studies and Research, this period will be exempt from the overall time limit allowed for completion of the program. A charge of \$50.00 per term of exemption from the time limit must accompany each request.

### 13.5 Extension of Time Limit

In exceptional cases, an extension of time permitting further registration (one or two terms) may be granted to a candidate whose recent progress, as judged by the department, has

been otherwise satisfactory. Requests for extension of time should be directed to the Dean of the Faculty of Graduate Studies and Research through the department concerned.

A charge of \$50 per term of extension beyond the normal time limit must accompany each request.

### 13.6 Grade Review

Within two weeks of the release of grades or the announcement of examination by committee (comprehensive examination, research essay or thesis) results, a graduate student may request, through the Dean of the Faculty of Graduate Studies and Research, that one or more of his/her grades or results be reviewed. The results of examination by committee (including comprehensive, research essay or thesis examinations) will only be reviewed on procedural grounds. Grades for other courses will be reviewed through the submission of all or part of the written coursework anonymously to two re-readers, whose average grade will replace the original of the reviewed work. Parts of grades based on non-written work (e.g., participation) will not be reviewed. The charge for such a review is \$50, which must accompany the review request. Note: The review process will not take place if the fee is not remitted. If the grade is raised, the \$50 charge is refundable.

### 13.7 Program Review

A graduate student has the right to request a review of decisions made concerning his/her graduate status or any other ruling relating to his/her program. All such requests are to be made in writing to the Dean of the Faculty of Graduate Studies and Research.

### 13.8 Records Retention Policy

Since 1990 the University has implemented a records retention policy which provides for the destruction of student file folders and their contents after a period of ten years has elapsed since the last registration. This policy applies to those students who are formally admitted and registered in degree programs. Further information on this policy can be obtained by contacting the Faculty of Graduate Studies and Research.

## 14. Instructional Offences

### 14.1 Regulations

The Senate of the University has enacted the following regulations for instructional offences at the graduate level:

Any student commits an instructional offence who:

(a) cheats on an examination, test, or graded assignment by obtaining or producing an answer by deceit, fraud, or trickery, or by some act contrary to the rules of the examination

(b) submits substantially the same piece of written work to two different courses. Minor modifications and amendments or changes of phraseology do not constitute a significant and acceptable reworking of an essay or paper

(c) contravenes the regulations published at an examination or which are displayed on the reverse side of a properly authorized examination booklet

(d) commits an act of plagiarism. Plagiarism will be deemed to have occurred when a student either:

(i) directly copies another's work without acknowledgement; or

(ii) closely paraphrases the equivalent of a short paragraph or more without acknowledgement; or

(iii) borrows, without acknowledgement, any ideas in a clear and recognizable form in such a way as to present them as the student's own thought, where such ideas, if they were the student's own, would contribute to the merit of his or her own work

(e) disrupts a class or other period of instruction if he or she:

(i) is a registered member of the class or period of instruction

(ii) is warned to discontinue any act or behaviour reasonably judged by the instructor of the course or period of instruction to be detrimental to the class, and having ignored such warning is ordered by the instructor to leave and refuses to leave

(f) Any student found in violation of these regulations may be:

(i) expelled

(ii) suspended from all studies at the University

(iii) suspended from full-time studies; and/or

(iv) awarded a reprimand

(v) refused permission to continue or to register in a specific degree program, but subject to having met all academic requirements shall be permitted to register and continue in some other program

(vi) placed on academic probation

(vii) awarded a Fail or Absent in a course or examination

Allegations of instructional offence may be investigated by instructors and/or departmental

chairs and, in all cases, will be reported to the faculty dean. The dean will promptly advise, in writing, the student and the University Ombudsman of the allegation and of the student's rights. The dean will review the allegation and if not resolved at that level, the allegation becomes subject to final disposition by a tribunal appointed by the Senate. Information about procedure governing tribunals is available from the Clerk of the Senate, Room 607, Robertson Hall.

## 15. Offences of Conduct

### Offences of Conduct-Discrimination and Harassment

The University has in place policies and procedures to deal with allegations of discrimination and harassment, including sexual harassment. These are outlined in detail in the *Carleton University Human Rights Policies and Procedures*, effective May 1, 2001 and which can be found on the Carleton website under Equity Services.

Unacceptable conduct is outlined in the policy and includes discrimination or harassment based on race, ancestry, place of origin, colour, ethnic origin, citizenship, creed, political affiliation or belief, sex, sexual orientation, gender identity, age, marital status, family status, or disability/handicap within the meaning of the *Ontario Human Rights Code*. Unacceptable conduct also includes threatening, stalking and unwelcome communication either in person or through electronic or other means. For the three policy sections below, the definition of prohibited behaviour is described in the italicized section which follows.

#### From the Anti-Racism and Ethnocultural Relations Policy

"6. The University prohibits discrimination and harassment, including conduct on the basis of race, ancestry, place of origin, colour, ethnic origin and citizenship that:

#### From the Gender Equality Policy

"6. The University prohibits discrimination and harassment, including conduct on the basis of sex, gender or gender identity that:"

#### From the Sexual Orientation Equality Policy

"5. The University prohibits discrimination and harassment, including conduct on the basis of sexual orientation or perceived sexual orientation that:"

*5.1 Is abusive, demeaning or threatening including behaviour such as name calling; derogatory remarks, gestures and physical attacks; or display of derogatory or belittling pictures and graffiti; or*

*5.2 Biases administrative and appointment decisions, employment and workplace practices, tenure, promotion, appointment, leave and salary determinations; or*

*5.3 Biases academic decisions such as admissions, grading, the application of regulations and requirements and scheduling of academic activities; or*

*5.4 Misuses power, authority or influence; or*

*5.5 Discriminates in the provision of goods and services, or access to premises, accommodation and other facilities."*

#### From the Sexual Harassment Prevention Policy

"6. Sexual harassment occurs when an individual engages in sexually harassing behaviour or inappropriate conduct of a sexual nature that is known, or ought reasonably be known, to be unwelcome, and that:

*6.1 Interferes with the academic or employment performance or participation in a University-related activity for the person harassed; and/or*

*6.2 Is associated with an expressed or implied promise of employment-related or academic-related consequence for the person harassed (including reward, reprisal or condition of study or employment); and/or*

*6.3 Provides a basis for academic or employment decisions affecting the person harassed; and/or*

*6.4 Creates an abusive, demeaning, or threatening study, work or living environment for the person harassed; and/or*

*6.5 Excludes the person harassed from rights and/or privileges to which they are entitled.*

7. Sexually harassing behaviour may be physical, verbal or psychological. It may be conveyed directly or by telephone, writing or electronic means. Examples of inappropriate sexual conduct include:

*7.1 Unwelcome sexual solicitations, flirtations or advances; sexually suggestive comments, gestures, threats or verbal abuse;*

*7.2 Unwarranted touching or physical contact of a sexual nature, coerced consent to sexual contact, or sexual assault;*

*7.3 Inappropriate display or transmission of sexually suggestive or explicit pictures, posters, objects or graffiti;*

*7.4 Leering, compromising invitations, or demands for sexual favours;*

*7.5 Degrading, demeaning or insulting sexual comment or content, including unwelcome remarks, taunting, jokes or innuendo about*

*a person's body, sexuality, sexual orientation or sexual conduct;*

*7.6 Misuse of position or authority to secure sexual favours;*

*7.7 Persistent, unwanted attention or requests for sexual contact after a consensual relationship has ended; or*

*7.8 A course of sexualized comment or conduct that interferes with the dignity or privacy of an individual or group."*

Enforcement of this policy is carried out according to the procedures established in the policy. The procedures include the provision of advice and information to complainants and respondents and allow for various methods of informal resolution, including mediation.

Students with concerns regarding discrimination, harassment, stalking, sexist or racist behaviour, or any other prohibited action as outlined in the Human Rights Policy, should call or meet with a member of Equity Services for advice and guidance on how to handle the situation. This service is confidential and does not compel the student to take any further action.

Formal complaints must be made in writing and directed to the Dean or Vice President responsible for the area where the complaint took place. Staff in Equity Services are available to assist with the preparation of a formal complaint. Complaints must be made within 12 months after the last alleged incident of discrimination or harassment unless exceptional circumstances apply in which case the University Secretary may grant an extension of up to an additional 12 months.

The procedure for formal complaints is outlined below:

1. an allegation shall be made in writing to the Dean of the Faculty in which the program to which the respondent has been admitted belongs or, in the circumstances where the respondent has not been admitted to a program, to the Dean of the Faculty where the majority of courses in which the respondent has registered are administered. An allegation against a student in residence when made by another student in residence which involves the complainant's enjoyment of her/his accommodation shall be made to the Vice-President (Academic). The Dean, or the Vice-President (Academic), as the case may be, shall cause to have an investigation conducted and, upon receipt of the report of the investigation, shall either 1) dismiss the allegation on the grounds of insufficient evidence or lack of jurisdiction by the University, or 2) accept that the allegation is founded and seek the agreement of the respondent to a remedy, or 3) refer the matter to the President. A Dean's dismissal of the

allegation may be appealed, within ten working days, to the Vice-President (Academic) who may, in turn, either 1) again dismiss the allegation, or 2) accept that the allegation is founded and propose a remedy to the respondent, or 3) refer the matter to the President. In the case of students in residence, where the original allegation has been made to the Vice-President (Academic) and is dismissed, appeal shall be directly to the President who may either 1) again dismiss the allegation, or 2) accept that the allegation is founded and propose a remedy to the respondent, or 3) refer the matter to a tribunal appointed by the Senate.

2. in the instance where the matter has been referred to the President, the latter shall decide whether or not the University shall conduct a hearing before a tribunal appointed by the Senate.

If the allegation is proven, the tribunal shall decide upon one of the following sanctions:

The student may be:

- a) expelled;
- b) suspended for a period of time from all studies at the University;
- c) restricted in his/her use of University facilities; and/or
- d) given a reprimand.

Should the President decide not to conduct a hearing before a tribunal, the allegation shall be deemed to have been dismissed, but the President shall give written reasons for such a decision, and these reasons shall be communicated to the parties involved.

3. in the instance where the complainant wants redress from the University without the involvement of the respondent, or where the respondent is unknown or is not a member of the University community, and/or where there is a claim that the University has failed or has been negligent in providing a safe, non-hostile environment, the allegation of an offence shall be made in writing to the President, who shall cause an investigation to be conducted. Upon receipt of the report of the investigation, the President may order any relief he/she deems fit, and shall give written reasons for the decision; which reasons shall be communicated to the complainant.

Information about procedure governing tribunals is available from the Clerk of Senate, 607 Robertson Hall.

## 16. Appeals and Petitions

### 16.1 Criteria and Procedures

Assuming that a graduate student has exhausted all avenues of appeal and petition with the Dean of the Faculty of Graduate Studies and Research (questions regarding the appeals process can be directed to the Office of the Dean at 520-2518), a graduate student may appeal the decision of the University to deny the award of degree or the required withdrawal of the student to the Senate upon certain specific grounds.

Such grounds are the allegation by the student that the student has been denied a degree or forced to withdraw because of some mistake, error, or improper conduct by the University, its officers, or employees.

A graduate student may petition the Senate to grant a degree or to stay a decision of required withdrawal on compassionate grounds.

Such appeals and petitions must be submitted in writing, within ninety days of receipt by the student of the decision which is to be appealed or petitioned, to the Clerk of the Senate, Room 607, Robertson Hall.

## 17. Graduation

### 17.1 Conferring of Degrees

On the recommendation of the Faculty of Graduate Studies and Research and with the approval of the Senate of the University, degrees are conferred by the Chancellor in the spring and fall of each year.

### 17.2 Application Deadlines

Candidates may have their degrees certified in February each year; they must apply by December 1. Students expecting to graduate at the Spring Convocation must apply for graduation in the Graduate Studies and Research office by February 1. Those expecting to graduate at the Fall Convocation must apply by September 1.

## 18. Engineering

In addition to University and Graduate Faculty Regulations, all Engineering departments share the following procedures.

Programs of study are offered by the Faculty of Engineering leading to the degrees of Master of Engineering and Doctor of Philosophy in Aerospace, Civil, Electrical, Environmental and Mechanical Engineering; to the degree of Master of Engineering in Materials Engineering, and Telecommunications Technology Management; and, in cooperation with the Faculty of Science, to the degree of Master of Science in Information and Systems Science.

Most graduate programs in the engineering departments at Carleton University and the University of Ottawa are administered through joint institutes in three engineering disciplines. The Ottawa-Carleton Institute for Electrical and Computer Engineering was established in 1983; for Mechanical and Aerospace Engineering in 1984; and for Civil Engineering in 1984. Each of these institutes combines the research strengths and resources of departments of engineering at Carleton University and at the University of Ottawa, and provides a framework for interaction. The institutes are also concerned with applications for graduate programs and graduate course offerings.

Programs leading to master's and Ph.D. degrees are available through the institutes in a wide range of sub-disciplines in each department.

The areas of current research, the research facilities available, and the graduate courses offered are given in the following pages for the four departments of the faculty:

- \* Civil and Environmental Engineering
- \* Electronics
- \* Mechanical and Aerospace Engineering
- \* Systems and Computer Engineering

Both the master's and Ph.D. programs may be undertaken on a full-time or part-time basis.

General information on awards and financial assistance is given in that section of this Calendar.

A limited number of students who are not degree candidates may be admitted to each graduate engineering course. Credit earned as a special student normally cannot be credited towards a graduate degree in engineering.

### 18.1 Computing Facilities

Computing facilities available to engineering students include the university's central Honeywell mainframes with time-sharing terminals. In addition, two VAX minicomputers, numerous SGI, SUN, and Apollo workstations, and many microcomputers reside in the engineering departments. Several other computers within the Faculty are in use for data acquisition and specific research projects.

### 18.2 Research in an Outside Institution

A student may apply for permission to carry out his/her research, in part or whole, in an outside institution (for example, industrial, governmental, or university laboratory). Such an application, addressed to the Dean of the Faculty of Graduate Studies and Research through the Dean of Engineering and Design, should:

\* Include a detailed statement of the research proposal, of arrangements for supervision, and of the circumstances under which it is to be carried out

\* Establish that the applicant will be able to pursue independent research

\* State the facilities available for the research

\* Include a proposed time schedule

\* Be accompanied by a supporting letter from a responsible person in the outside institution giving approval of the proposal and accepting these regulations

### 18.3 Part-time Thesis Research

A part-time research program may be permitted if the conditions for the "presence" of the student (outlined under faculty regulations) are satisfied. It is the responsibility of the research supervisor to define the fraction of full-time research engaged upon by the student so that this can appropriately be credited to his/her program and assessed for payment of tuition fees. Before permission to undertake research on a part-time basis can be granted, the student must submit in writing, to the Dean of the Faculty of Graduate Studies and Research through the Dean of Engineering and Design, a statement of his/her proposed manner of working part time, supported by a letter of approval from his/her employer.

### 18.4 Waiver of Thesis

A candidate for the master's degree who has, before admission, completed independent research or development projects of an adequate level of accomplishment, may apply to the chair of the department concerned for a waiver of the thesis requirement. Such application must be made at the time of initial registration, and must be supported by copies of published reports describing the work. If the application is approved, the candidate must complete ten 0.5 credits, six of which must be graduate-level courses in engineering, to fulfill the requirement for the award of a degree without a thesis. A candidate who has been granted a waiver of the thesis requirement may be required to take an oral examination on the subject of one of his/her published papers and topics related to his/her field of specialization.

### 18.5 Transfer of Credit

Normally, 1.0 credit completed at another university may be accepted in partial fulfillment of degree requirements, provided that the course is appropriate to the candidate's program at Carleton University. Under special circumstances, a second 1.0 credit may be allowed. Refer to the General Regulations section of this Calendar for details of the rules governing transfer of credit (see p.56).

### 18.6 Transfer from Master's to Ph.D. Program

A student who shows outstanding academic performance and demonstrates high promise for advanced research during the full-time master's program at Carleton University may, subject to meeting the requirements below, and with the approval of the admissions committee of the joint institute administering his/her graduate program, be permitted to transfer into the Ph.D. program without receiving the master's degree. Such a student must complete the course requirements and thesis registration requirements of the master's program, but is exempted from submission of the thesis.

A student wishing to transfer should apply to the chair of his/her department. If the department and the Faculty of Graduate Studies and Research approve the application, the candidate will be required to take the comprehensive examination for the Ph.D. The requirements for the comprehensive examination will include the submission of a report on research to date, and a research proposal for the Ph.D.

After successfully passing the comprehensive examination, the student will be admitted to the Ph.D. program with normal program requirements (but with the comprehensive examination to his/her credit). If unsuccessful, he/she will remain in the master's program and be required to submit the thesis in the usual way.

### 18.7 Faculty Regulations

Graduate students in the Faculty of Engineering are governed by the section of this Calendar entitled General Regulations, and by the regulations stated in this section.

All graduate students in the Faculty of Engineering must obtain satisfactory grades in their course work, must make satisfactory progress in their research if a thesis is included in their program, and must satisfy the following criteria of activity or "presence" in the program:

\* Maintain a close working relationship with their research supervisor

\* Attend the courses for which they are registered

\* Submit written reports and present seminars as required by their supervisor

\* Attend departmental seminars held regularly to discuss current research and related topics. Each student is required from time to time to present a seminar on his/her research; part-time students who are not actively engaged in research are exempt from the seminar requirement

\* Be readily available on an informal basis

## 18.8 Thesis Regulations

The thesis must represent the result of the candidate's independent research or development work, undertaken after admission to graduate studies at Carleton University. Experimental or theoretical results previously published by the candidate may be used only as introductory or background material for the thesis. A candidate may be permitted to carry on thesis research work off campus, provided that the work is approved in advance, and arrangements have been made for supervision of thesis research activities by a faculty member of Carleton University. A part-time student may use the Faculty of Engineering laboratory facilities for on-campus thesis research and development activities.

Each candidate submitting a thesis will be required to undertake an oral examination on the subject of the thesis and related fields.

## 18.9 Registration and Course Selection

\* Undergraduate engineering courses may not normally be taken for credit.

\* All students require departmental approval for their program of studies, for course registration, and for any changes to their status or program.

\* Each full-time student is required, in any fall or winter program requirements of three or more 0.5 credit courses, to register for credit in at least three 0.5 credit courses. After the last day for withdrawal from courses in each such term, the student must remain registered in at least three 0.5 credit courses.

\* For part-time students, the department will arrange the appropriate course load and selection.

## 18.10 Master of Engineering

### Admission Requirements

Applicants are admitted under the general regulations specified in this Calendar, but, in addition, are required to have strong undergraduate preparation in the appropriate engineering disciplines, computer programming, mathematics, and physics.

### Program Requirements

Two alternatives are available for full-time students studying towards the degree of Master of Engineering, one involving a thesis plus course work, the other involving course work only. The choice of these alternatives must be arranged and approved at the time of admission into the program. Students are encouraged to take at least 0.5 credit outside of their department.

### *M.Eng. by Thesis*

\* A thesis based on the student's research

\* A minimum of 3.0 credits in engineering or a related discipline. The number of credits required by each department is specified in its section of this Calendar

### *M.Eng. by Course Work*

Specific program requirements are detailed in the departmental sections of this Calendar.

## 18.11 Ph.D. In Engineering

### Admission Requirements

For admission to the Ph.D. program, an applicant must normally hold a master's degree in engineering (or its equivalent) and, by his/her previous program of study and scholastic record, demonstrate a capacity for advanced study and research. Experience gained while working in an engineering or research environment will be taken into account when assessing an application. The applicant must specify his/her intended field of research.

### Program Requirements

The specific program requirements for the Ph.D. degree are the following:

\* A minimum of two calendar years of full-time study (or the equivalent)

\* Course requirements as established on admission, but not less than the minimum requirements as stated in each joint program Institute section of this Calendar. Students should note that the minimum number of credits required in the Ph.D. program varies among the joint Institutes. Subject to approval of the student's adviser or advisory committee, the student may take, or be required to take, courses in an appropriate discipline outside the Faculty of Engineering. For information on admission and program requirements for the Departments of Civil Engineering (see p.115), Environmental Engineering (see p. 177), Electronics (see p.162), Mechanical and Aerospace Engineering (see p.251) and Systems and Computer Engineering (see p.326).

\* Substantial research

\* A thesis on the research

### Advisory Committee

An advisory committee with at least three members will be appointed by the department soon after a student's first registration. It has the responsibility of ensuring that conditions for the pursuit and completion of the student's program are fulfilled, and it reviews his/her program at least once a year.

## Comprehensive Examination

The comprehensive examination is held approximately one year after initial registration in the program in the case of full-time students, and at an equivalent time in the case of part-time students. The purpose of the examination is threefold:

- \* To assess the student's comprehensive knowledge of his/her field of study
- \* To assess the preparedness and capability of the student for doctoral research
- \* To judge the suitability of the research topic for a doctoral thesis

The student is required to present his/her research proposal, and to be subjected to oral and written examination in appropriate fields of study. He/she will be informed by the advisory committee of the specific requirements of the examination. Having successfully completed the comprehensive examination, the student becomes a doctoral candidate.

# Academic Programs, Units and Courses

- Architecture
- Art History
- Biology, Ottawa-Carleton Institute
- Biostatistics, Collaborative Program
- Business
- Canadian Studies
- Chemistry, Ottawa-Carleton Institute
- Chemical and Environmental Toxicology, Collaborative Program
- Civil and Environmental Engineering
- Civil Engineering, Ottawa-Carleton Institute
- Cognitive Science
- Comparative Literary Studies
- Computer Science
- Computer Science, Ottawa-Carleton Institute
- Cultural Mediations
- Economics
- Electrical and Computer Engineering, Ottawa-Carleton Institute
- Electrical Engineering, University of Ottawa
- Electronics
- English Language and Literature
- Environmental Engineering
- European and Russian Studies
- Film Studies
- French
- Geography
- Geoscience, Ottawa-Carleton Centre
- History
- Industrial Design
- Information and Systems Science
- Interdisciplinary Studies
- International Affairs
- Journalism and Communication
- Law
- Linguistics and Applied Language Studies
- Mass Communication
- Mathematics and Statistics, Ottawa-Carleton Institute
- Mechanical and Aerospace Engineering
- Mechanical and Aerospace Engineering, Ottawa-Carleton Institute
- Mechanical Engineering, University of Ottawa
- Music
- Neuroscience
- Philosophy
- Physics, Ottawa-Carleton Institute
- Political Economy
- Political Science
- Public Policy and Administration
- Religion
- Social Work
- Sociology and Anthropology
- Women's Studies

# Architecture

Architecture Building 202  
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## The School

**Director of the School,** Gulzar Haider

**Supervisor of Graduate Studies,** Stephen Fai

The School of Architecture offers programs of study and research leading to the Master of Architecture Professional degree and a specialized Master of Architecture Post-professional degree.

## M.Arch. Professional

The Master of Architecture Professional degree is awarded upon the successful completion of a full two-year program of studies. The program is studio-based with a strong theoretical component, culminating in a two-credit thesis. The thesis is expected to include both a written text and a design component with appropriate modes of two and three-dimensional representation. Candidates should note that only work of the highest caliber will be accepted. It is expected that students will take a minimum of two terms to complete their thesis requirement. Final submission of all thesis work must be in a publishable format.

The Canadian Architectural Certification Board (CACB) recognizes this degree as an academic prerequisite for registration in the Intern Architect Program. Further information on professional registration can be obtained from the CACB or from one of the provincial associations.

## M.Arch. Post-Professional

### *Theoretical Issues in Architecture and Culture*

The Post-Professional M.Arch. is a three-term specialized program allowing students with a professional degree in architecture to pursue advanced research at a graduate level. The program is research oriented and culminates with the completion of a thesis. Inter-departmental collaborations are encouraged. Thesis proposals are developed under the tutelage of a prospective thesis supervisor and are expected to address one of the theoretical issues of architecture and culture outlined below. The thesis is expected to include both a written text and appropriate modes of two and three-dimensional representation. Final submission of all thesis work must be in a publishable format.

Research into issues of architecture and culture in the post-professional M.Arch. are organized around two areas of inquiry:

### *Architecture and Cultural Diversity*

'Architecture and Cultural Diversity' is concerned with the patterns and interrelationships of cultural issues and processes as they are manifest in built form and as they inform architectural design. Current research topics include:

- \* The History and Theory of Architecture
- \* Architecture and Urban Issues

For specific areas of faculty research, please consult the School's website.

The positioning of these research topics within the broader discourse on the history and theory of architecture is the subject of two core seminars offered consecutively in the fall and winter terms of the first year. The core seminars are supplemented with studies in cultural and architectural history and theory.

### *Design and Technology*

Electronic technologies and screen-based interfaces extend and challenge traditional modes of visual expression. Simulated realities, expert systems, electronic modeling, visualization, and CAD applications open infinite possibilities in visual, written, and interactive communications. Moreover, the convergence of data as digital information allows for an unprecedented mixing and integration of media.

'The Design and Technology' area of the program addresses the need to engage technically-advanced tools in design studies and to bring design expertise to bear on new media, interfaces, software and technology products. The design of physical environments has long been the purview of architects; the Design and Technology specialization brings principles of architectural and graphic design to bear on virtual spaces, environments and graphic interfaces.

Please note that the M.Arch. Post-professional is not recognized by the Canadian Architectural Certification Board as an academic prerequisite for professional certification. Students wishing to pursue professional studies in architecture are referred to the professional M.Arch. discussed above.

## Qualifying-Year Program

Candidates with deficiencies in certain areas may be required to take additional prescribed courses as prerequisites to their graduate work. Applicants who do not possess a professional degree in Architecture may be required to register in the qualifying-year program (normally 5.0 credits at the 400-level). All courses must be approved by the graduate admissions committee of the School in consultation with the Faculty of Graduate Studies and Research. Upon successful completion of these courses, students may be permitted to proceed to the M.Arch. (Design Studies) program.

## Admission Requirements

### M.Arch. Professional

Students may be admitted to the M.Arch Professional program following the successful completion of the Bachelor of Architectural Studies (see undergraduate calendar) or a four-year undergraduate degree deemed comparable to the B.A.S. by the School's graduate admissions committee. All applicants are expected to have maintained a minimum academic average of B- in their undergraduate studies. In addition to these academic credentials, applicants must submit for review two examples of academic writing and a portfolio of creative work demonstrating facility in architectural design and methods of representation. Professional experience may be taken into consideration.

Where applicants do not hold a B.A.S. of comparable four-year degree, but hold a four-year undergraduate degree with a concentration in architecture, equivalence may be considered on the basis of a demonstrated, exceptional design ability and high academic standing (B+ minimum average). Applicants are required to submit a complete portfolio of artistic and design work produced during their undergraduate studies and two examples of academic writing. Professional experience may also be taken into consideration.

When professional work is included as part of an applicant's portfolio, a precise description of the applicant's involvement and responsibilities in the completion of the project must be included.

All applicants must provide two confidential letters of reference on the prescribed forms and a statement of academic and professional objectives.

The Faculty of Graduate Studies and Research requires applicants whose native tongue is not English to be tested for proficiency in English, as described in Section 3.6 of the general regulations. Note, however, that students with a TOEFL score below 600 will not be considered for admission to the M.Arch Professional.

An admissions committee, which includes the supervisor of graduate studies, will determine the merits of each candidate on the basis of academic record, evidence of visual and architectural design ability, and, where applicable, professional experience. Enrollment is limited. The School's admission policy is governed by the availability of graduate student space. Possession of the minimum academic admission requirement does not, in itself, guarantee admission.

The deadlines for submission of applications for graduate studies (professional) in Architecture are as follows: March 1 for students re-

questing financial assistance; June 1 for students who are not seeking financial assistance but who are seeking admission in September. Applications are not accepted for admission in January.

### M.Arch. Post-Professional

Students are admitted to the post-professional stream of the M.Arch. program on the basis of a first professional degree in architecture with evidence of undergraduate studies in the humanities and/or social sciences. Students are expected to have maintained a minimum academic average of B-. In addition to these academic credentials, applicants must submit for review two examples of academic writing and a portfolio of creative work demonstrating facility in architectural design and methods of representation. Professional experience may also be taken into consideration.

Where applicants do not hold a professional degree in architecture but possess either a professional degree in a related design discipline or an Honours B.A. in Fine Arts or the Humanities, equivalence will be considered on the basis of a demonstrated, exceptional design ability and a high academic standing (B+ minimum average). Applicants are required to submit a complete portfolio of artistic and design work produced during their undergraduate education and two examples of academic writing. Professional experience may also be taken into consideration.

All applicants must provide two confidential letters of reference on the prescribed forms and a statement of academic and professional objectives.

An admissions committee, which includes the supervisor of graduate studies, will determine the merits of each candidate on the basis of academic record, evidence of visual and architectural design ability, and, where applicable, professional experience. Enrollment is limited. The School's admission policy is governed by the availability of graduate space. Possession of the minimum admission requirements does not, in itself, guarantee acceptance.

The Faculty of Graduate Studies and Research requires applicants whose native tongue is not English to be tested for proficiency in English, as described in Section 3.6 of the general regulations. Note, however, that students with a TOEFL score below 600 will not be considered for admission to the professional M.Arch.

The deadlines for submission of applications for graduate studies (post-professional) in Architecture are as follows: March 1 for students requesting financial assistance; June 1 for students who are not seeking financial assistance but who are seeking admission in September; October 1 for students who are seeking admission in January.

## Program Requirements

### M.Arch. Professional

#### General requirements:

- \* 2.0 core course credits
- \* 1.0 elective course credits
- \* 3.0 studio credits
- \* 2.0 credit thesis which must be defended at an oral examination

A list of approved electives is available from the Graduate Administrator at the School of Architecture. All non-core courses must be approved by the Supervisor of Graduate Studies.

#### Specific requirements:

##### Year 1

*Fall Term* Architecture 76.520, 77.510, 80.515

*Winter Term* Architecture 76.521, 78.420 or 0.5 credit elective\*\*, 80.516

##### Year 2

*Fall Term* 0.5 credit elective\*\*, Architecture 80.599\*\*\*

*Winter Term* Architecture 78.420\* or 0.5 credit elective\*\*, 80.599\*\*\*

\* Architecture 78.420 is a core course. It can be taken in the winter term of either year 1 or year 2..

\*\* An advanced course at the 400-level or above chosen from a selected list of approved electives.

\*\*\* 80.599 is expected to extend over two terms. By the end of the first term of thesis registration, students will submit a report for which an interim grade will be awarded. This report will follow guidelines prescribed by the Supervisor of Graduate Studies

### M.Arch. Post-Professional

#### Architecture and Cultural Diversity

##### General requirements:

- \* 1.5 core course credits
- \* 1.5 elective course credits
- \* 2.0 credit thesis which must be defended at an oral examination

A list of approved electives is available from the Graduate Administrator at the School of Architecture. All non-core courses must be approved by the Supervisor of Graduate Studies.

#### Specific requirements:

- \* Architecture 76.501 (0.5 credit)
- \* Architecture 76.502 (0.5 credit)
- \* Architecture 76.503 (0.5 credit)
- \* 0.5 credit in the area of architectural theory (an advanced course at the 400-level in the theory of architecture offered by the school of architecture)
- \* 0.5 credit in the area of cultural theory at the 500-level or above in the general field of cultural theory
- \* 0.5 credit elective chosen from an approved list of courses in the area of cultural studies, cultural theory, cultural production, the built environment and related subjects.
- \* Architecture 76.599 (2.0 credit thesis)

The program is normally completed in three terms of full-time study.

### Design and Technology

#### General requirements:

- \* 2.5 core course credits
- \* 0.5 elective credits
- \* 2.0 credit thesis which must be defended at an oral examination

A list of approved electives is available from the Graduate Administrator at the School of Architecture. All non-core courses must be approved by the Supervisor of Graduate Studies.

#### Specific requirements:

- \* Architecture 77.501 (0.5 credit)
- \* Architecture 77.502 (0.5 credit)
- \* Architecture 79.511 (1.0 credit)
- \* Architecture 79.512 (0.5 credit)
- \* 0.5 credit elective chosen from an approved list of courses in the area of culture and technology at the 400-level or as approved by the Graduate Supervisor.
- \* Architecture 77.599 (2.0 credit thesis)

The program is normally completed in three terms of full-time study.

### Academic Regulations

See the general regulations of the Faculty of Graduate Studies and Research

### Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the Registration Instructions and Class Schedule booklet

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Qualified students in other departments may, with permission of the School, enroll in Architecture 76.501, 76.502, 76.503, 77.501, 77.502, 79.511 and 79.512

Architecture 76.501F1

### **Architecture Seminar 1**

An introduction to the intellectual frameworks connecting design and culture as manifest in theories of culture and architecture. The seminar builds on previous undergraduate studies, and is not as an introduction to these fields. The field of inquiry is both historical and contemporary.

Architecture 76.502W1

### **Architecture Seminar II**

A continuation of Architecture 76.501, this seminar follows the same general description, but concentrates more on architectural design, on the contemporary condition, and on the ways of thinking that characterize embodiment of cultural content in architecture and other artifacts.

Architecture 76.503W1

### **Design and Culture Workshop**

The prime objective of the workshop is experimental and provides an opportunity to investigate cultural issues in architectural design. The workshop operates as a directed study with specific content, objectives, and scheduling arranged between student and academic advisor.

Architecture 76.520F1

### **Graduate Seminar 1: Introduction to Critical Thought in Architecture**

Introduction to critical theories and research approaches relevant to the field of architecture. Identification of issues through a coordinated series of lectures and readings. Development of analytical and interpretative skills through seminar discussions and writing culminating in a scholarly position paper by the student.

Architecture 76.521W1

### **Graduate Seminar 2: Contemporary Theoretical Perspectives in Architecture**

Lectures, readings, and case studies on contemporary issues in architecture and allied fields of study. Critical analysis of current trends and possibilities set against traditional modes of architectural thought and practice. This course serves as a forum for a preliminary articulation of the thesis proposal.

Architecture 76.599F4, W4, S4

### **M.Arch. Post-Professional Thesis (Architecture and Cultural Diversity)**

A scholarly, written thesis supported by appropriate methods of two and three-dimensional representation. Research undertaken by the student is expected to engage one of the research topics outlined above. Documentation must be in a publishable format. All proposals must be approved by the graduate committee of the School of Architecture.

Architecture 77.501F1

### **Introduction to Design and Multimedia**

An introduction to the broad field of multimedia and interactive design as it relates to architecture and the general field of design. Special topics include virtual environments, user interface in software, web and product design, perceptual and cognitive science, navigation, film/video and sound editing and animation technologies.

Architecture 77.502W1

### **Topics in Design and Multimedia: Information Architecture and the World Wide Web.**

An introduction to the design of web-based applications, focusing on process, site architecture, usability testing, and web functionality. Students synthesize and customize various software applications in the production of a major web-based project, incorporating both client and server-side functionality. Students are introduced to relational database design, JavaScript, cgi scripts, and "middleware" products such as WebObjects and ColdFusion.

Architecture 77.510F1

### **Advanced Building Systems**

This course will introduce advanced design in building technology and systems integration. Leading edge building materials, technologies and philosophies will be explored through intensive case study research and analysis, comparing, and critically evaluating, traditional methods with current computer modeling and analysis techniques.

Architecture 77.599F4, W4, S4

### **M.Arch Post-professional Thesis (Design and Technology)**

Basic or applied research in architectural, industrial, and digital design. Areas include interactive education/training, product/interface design, programming/scripting, culture/technology, or research as defined by the student. Documentation must be in a publishable format. Topics must be approved by the graduate committee of the School of Architecture.

Architecture 78.420W1

### **Introduction to Professional Practice**

The practice of architecture. Professional organization and conduct, the architect's services, business law, office organization and man-

agement, contract documents, building codes, contract management, cost control, accounting and site supervision. Guest speakers and case studies.

Architecture 79.511F2

### **Interactive Design Workshop I**

An intensive introduction to the design of interactive environments. Students learn, use and evaluate a range of multimedia software including Adobe Photoshop, Illustrator, Premiere, Macromedia, Dreamweaver, Fireworks, Director, 3D Modeling programs, and sound editing. Basic design, graphic design, and software literacy are emphasized. The course includes presentations by design professionals working in the field.

Architecture 79.512W1

### **Interactive Design Workshop II**

An introduction to the logistic aspects of producing multimedia products with an emphasis on usability testing and user interface design. Topics include: storyboarding and graphic design, instructional design, rapid prototyping, project streaming, management and marketing, technical writing and product evaluation. Organized as a seminar. Work is done in teams.

Architecture 80.515F1

### **Graduate Studio 1**

An architectural investigation within a contemporary urban setting, usually dealing with central-city sites and complex programs. Projects address the question of urban architecture both from practical and theoretical perspectives. Architecturally relevant building technology and systems will be introduced in the Studio as required.

Architecture 80.516W1

### **Graduate Studio 2**

The design of a large-scale and culturally significant building project, set within a prominent urban or natural landscape. Integrated resolution of the combined issue of site, program, and expression is expected. Architecturally relevant building technology and systems will be introduced in the Studio as required.

Architecture 80.599FW2

### **M.Arch. Professional Thesis**

Student initiated design investigation, developed in association with a thesis supervisor, supported by written text and appropriate methods of two and three-dimensional representation. Documentation must be in a publishable format. All proposals must be approved by the graduate committee of the School of Architecture.

## **Other Course Offerings**

The School offers graduate-level courses that can be used towards degree programs in the Faculty of Engineering, the School of Canadian Studies, and the Faculty of Public Affairs and

Management at Carleton University. In addition, there is an understanding with the Faculty of Environmental Studies at York University, the Centre for Building Studies at Concordia University, and the Faculté de l'Aménagement at the Université de Montréal, Recognizing graduate course work undertaken at Carleton University's School of Architecture. Members of the School may also supervise graduate research at these institutions.

Faculty interest and expertise lie in the following areas:

## **History and Theory of Architecture**

Scholarly studies in architectural thought of late antiquity, early Christianity, the renaissance, baroque, the modern movement, post-modernism, as well as Canadian Architecture and the architecture of Islam.

## **Architecture and Society**

Ethnicity, multiculturalism and architectural expression; international development and indigenous architecture; heritage and preservation; evolution of the architectural profession.

## **Architecture and Technology**

Building envelope and construction detail; design economics; structures; energy; lighting; acoustics; integration of systems.

## **Architecture and the City**

Urban morphologies, architectural content of urban planning and design; social, cultural, economic, and political matrix in the urban society and the contemporary architectural reality.

## **Computer-Aided Design and Management**

Design and modeling, visual communication, computer graphics; computers and architectural practice.

## **Architecture and Morphology**

Studies in form, space, structure, and order; geometric and symbolic orders in architecture.

## **Design/Build**

Applied architectural research, proto-type development.

The following courses are available to students from other departments who hold an honours degree or equivalent in a related academic discipline. Permission of the School is required for registration.

Architecture 76.500F1, W1

### **Directed Studies in History and Theory of Architecture**

Reading and research tutorials.

Architecture 76.510F1, W1

**Directed Studies in Architecture and Society**

Reading and research tutorials.

Architecture 77.500F1, W1

**Directed Studies in Architecture and Technology**

Reading and research tutorials.

Architecture 77.541F1, W1, S1

**Workshop: Technical Studies in Heritage Conservation**

(Also listed as Canadian Studies 12.541)

Architecture 78.500F1, W1

**Directed Studies in Architecture and the City**

Reading and research tutorials.

Architecture 78.542F1, W1, S1

**Workshop: Urban Studies in Heritage Conservation**

(Also listed as Canadian Studies 12.542)

Architecture 79.500F1, W1

**Directed Studies in Computer-Aided Design**

Reading and research tutorials.

Architecture 79.501F1, W1

**Directed Studies in Architecture and Morphology**

Reading and research tutorials.

# School for Studies in Art and Culture: Art History

St. Patrick's Building 423  
Telephone: (613) 520-2342  
Fax: (613) 520-3575

## The School

**Director,** Bryan Gillingham

**Supervisor of Graduate Studies,** To be announced

The School for Studies in Art and Culture offers a program of study and research leading to the degree of Master of Arts in Canadian Art History. The program is unique in its breadth and comprehensiveness. Students can choose to focus on art and architecture drawn from Canada's wealth of different artistic communities, including the traditions of Euro-Canadians, aboriginal peoples, other ethnic groups, and women. They are encouraged to consider these traditions as aesthetic expressions and within broad contexts of race and gender and of social, political, and economic history.

## Qualifying-Year Program

Applicants who do not qualify for direct admission to the master's program may be admitted to a qualifying-year program. Applicants who lack an Honours degree, but have a 3-year degree with an honours standing (at least *B* overall) will normally be admitted to a qualifying-year program. Refer to the general Regulations section of this Calendar (see p. 52.)

## Master of Arts

### Admission Requirements

The minimum requirement for admission to the master's program is an Honours bachelor's degree (or the equivalent) in art history or a related discipline, with at least high honours standing. Related disciplines may include anthropology, Canadian history, and Canadian studies. Applicants without a background in art history may be required to take up to a maximum of 2.0 credits in certain designated courses from the undergraduate art history program in addition to their regular program.

### Program Requirements

The specific program requirements for students in the M.A. program are as follows:

- \* Art History 11.500 (1.0 credit)
- \* 2.0 credits with a minimum of 1.0 and no more than 1.5 to be taken from the following

six areas of concentration in Canadian art: Euro-American tradition, Indian art, Inuit art, architecture, photography, folk and popular arts

\* Art History 11.599 (2.0 credits)

Subject to the approval of the graduate supervisor, 0.5 credit may be taken outside the Art History program. A maximum of 1.0 credit may be selected from course offerings at the 400-level in Art History.

The student's program will be developed in consultation with the graduate supervisor and graduate faculty of Art History, and must be approved by the graduate supervisor. The prescribed program will take into account the student's background and special interests, as well as the research strengths of the Art History graduate faculty.

## Deadlines

### Thesis Proposal

Full-time students will normally submit their thesis topic to the thesis proposal board no later than April 15 of the first year of registration for students enrolled full-time, and no later than the middle of the fifth term of registration for students enrolled part-time.

### Thesis

Regulations governing requirements for the master's thesis, including deadlines for submission, are outlined in the General Regulations (see p.64.)

## Language Requirements

Students are required to demonstrate a reading knowledge of French (or another language to be approved by the Art History graduate supervisor).

## Academic Standing

A standing of *B-* or better must be obtained in each credit counted towards the master's degree.

## Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Art History 11.500T2

### **The Practice of Canadian Art History**

Examination of the historiography of native and non-native Canadian art history; history and practice of collecting institutions, including contemporary theoretical approaches; cross-cultural and multi-cultural aspects of contemporary art, with on-site research in the major collecting institutions of the National Capital Region.

Art History 11.501F1, W1 or S1

### **Graduate Practicum**

Practical on-site work in the collecting institutions of the National Capital Region (as available), including a written assignment. The practicum coordinator and the on-site supervisor jointly determine the final mark. A maximum of 1.0 practicum credit may be applied towards degree requirements.

Art History 11.502F1, W1, S1

### **Directed Readings and Research**

Students may pursue topics in Canadian art, which they have selected in consultation with the graduate faculty of the program.

Art History 11.511F1 or W1

### **Topics in Historical Canadian Art**

A consideration of social, political, and economic contexts of Canadian art in selected periods from French settlement to 1900. Emphasis will be placed on the transformation of European traditions by artists and sculptors and on the impact of Canada's geographical proximity to the United States.

Art History 11.512F1 or W1

### **The History of Art Criticism in Canada to 1940**

Critical reaction to art exhibitions held by the Ontario Society of Artists, the Art Association of Montreal, and the Royal Canadian Academy will be examined with reference to public opinion, critical methodology, and aesthetic attitudes as an indication of the world-view these represent.

Art History 11.513F1 or W1

### **Esotericism in Canadian Art**

This course examines the influence of such factors as Theosophy, mysticism, Buddhism and alchemy on selected twentieth-century artists and their work. It also addresses the theoretical and methodological problems raised by such influences.

Art History 11.514F1 or W1

### **Canadian Women Artists: Between the World Wars**

An examination of art by women in light of the role played by painters, sculptors, printmakers and photographers in the formation of artists' groups, in the development of modernist art and in the production of commissioned works of art which served as Canadian civic and/or national symbols.

Art History 11.515F1 or W1

### **Reading Modernism and Post-Modernism in Canada**

This course will examine writings on Canadian modernist and post-modernist art by artists and critics in light of current concerns about audience response and reception theory.

Art History 11.516F1 or W1

### **Contemporary Women Artists - 1970 to the Present: Vision and Difference**

This course will consider the art of contemporary women artists in the context of cultural, social/political and feminist issues. Examination of patronage systems, viewer response and contemporary art theory will provide additional foci for the discussion of gender and contemporary art-making.

Art History 11.517F1 or W1

### **Public Art in Canada: Issues and Realities**

This course examines works of art commissioned for public spaces. Emphasis is placed on analysis of the art and the interrelationships among the artist, the patron, the critic and the public. Consideration is also given to social, cultural and political contexts.

Art History 11.518F1 or W1

### **Contemporary Canadian Earthworks and Environmental Art**

This course examines selected Canadian artists who create art in nature, and/or with the elements of earth, air, fire and water. These artists are considered from the perspectives of international environmental art, the Canadian landscape tradition, and current ecological concerns.

Art History 11.519W1

### **Aspects of Contemporary Art Practice**

Examination of contemporary art practice in Canada, including the artist collective, traditional and new media (painting, sculpture, installation, video, computer art), the relationship of artist and society, critical and public reception of contemporary art, as well as interaction between institutional collecting and artist-run centres.

Art History 11.520F1 or W1

### **Art of the Woodlands First Nations in the Historic Period**

This course will examine traditions of art-making in eastern Canada from the beginning of European contact through the early twentieth century. It will consider three major cultural groupings: the Eastern Sub-Arctic, the Iroquoian peoples, and the Algonkian peoples.

Art History 11.521F1 or W1

### **Art of the Plains First Nations in the Historic Period**

An examination of distinctive artistic expressions of a regional culture - the Canadian Plains First Nations - in the historic period. Reference

will be made to traditional art forms, symbolism, and the adjustments made by native artists to the changing socio-economic context in the historic period.

Art History 11.522F1 or W1

**Art of the North-West Coast First Nations in the Historic Period**

Art of Canada's North-West Coast First Nations, from contact through early twentieth century, with reference to ritual contexts and use, as an expression of relations with European colonizers (tourist art), and as a symbolic system generated by historical, social, and environmental factors.

Art History 11.523F1 or W1

**Museums and First Nations in Canada**

This course will study the representation of aboriginal culture in Canadian museums through the historical examination of institutions, exhibitions and collecting and research policies. Particular emphasis will be placed on changing treatments of objects as 'art' and as 'artifact.'

Art History 11.524F1 or W1

**Contemporary First Nations Art**

This course will study selected aspects of contemporary aboriginal art in Canada, focusing on the period since 1960. Current debates about museum representation, appropriation, and marginalization will also be discussed.

Art History 11.526F1 or W1

**Canadian Art and the Museum**

An examination of how visual arts produced by peoples in Canada have been represented in museums and art galleries, including theories of museum representation and the historical development of the museum in western culture, and the histories of Canadian institutions and their landmark exhibitions.

Art History 11.527F1 or W1

**Creating an Exhibition**

Students curate an exhibition of Canadian works for a museum or gallery in the Ottawa region, under guidance from museum professionals, who instruct in curatorial practice, from the development of an exhibition concept, selection and research of works, writing texts and designing the installation.

Art History 11.528F1 or W1

**Museum Studies and Curatorial Practice: Theory and Practice**

A seminar realizing an exhibition of Canadian art to be presented at the Carleton University Art Gallery. This will involve conceptualization, research, selection, cataloguing, labeling, promotion, contextualization, and evaluation using the collections of the Gallery.

Art History 11.530F1 or W1

**Prehistoric and Historic Inuit Art**

A study of prehistoric and historic cultural production by North American Arctic peoples,

comparing perspectives of art history and anthropology, regarding aesthetic and utilitarian requirements in objects of use, artistic continuity and change, and the diffusion of style through time and across geographic area.

Art History 11.531F1 or W1

**Contemporary Inuit Sculpture**

The development of contemporary Inuit sculpture from 1949 to the present is addressed with reference to the evolution of regional and individual styles and the effect of government policies and market forces on work, including issues of acculturation, identity, and cultural affirmation.

Art History 11.532F1 or W1

**Contemporary Inuit Graphic Arts**

An examination of contemporary Inuit graphic arts from 1957 to the present, with attention to regional and individual styles and the effect of government policies and market forces on the work, as well as issues of acculturation, identity, and cultural affirmation.

Art History 11.533F1 or W1

**Topics in Contemporary Inuit Art**

Selected topics in the historical development and significance of Canadian Inuit art in the broad context of world art may include such broad themes as historiography, cross-cultural aesthetics, and the relationship of contemporary Inuit art to contemporary critical and social theory.

Art History 11.540F1 or W1

**Aspects of Historical Architecture in Canada**

A selective examination of historical Canadian architecture from French settlement to Confederation, including traditional architecture of Quebec, the role of British-trained architects after 1760, the impact of patronage, the emergence of distinctive Canadian forms, and the professional recognition of architects apart from builders.

Art History 11.541F1 or W1

**Canadian Architecture 1867-1940: Themes and Approaches**

This course will examine the traditional interpretations of Canadian architecture in light of current research methodologies and recent advances in historical writing. Emphasis will be placed on architecture from the Parliament Buildings in Ottawa to the advent of the Modern Movement.

Art History 11.542F1 or W1

**Architectural Drawings in Canadian Collections**

This course will introduce students to major collections in Canada and to problems posed and insights gained through study of original perspectives, elevations, plans and working drawings.

Art History 11.543F1 or W1

**Contemporary Canadian Architecture**

An examination of the leading figures and trends in Canadian architecture since 1950. This includes the influence of international modernism, regionalism, urban theory, and postmodernism.

Art History 11.550F1 or W1

**Historical Canadian Photography**

This course will examine the emergence of photography in Canada in the nineteenth and early twentieth centuries. Photographs will be examined from the perspective of their format and aesthetic qualities as well as in social, political and cultural contexts.

Art History 11.551F1 or W1

**Modern Canadian Photography**

This course will examine the developments in pictorial, documentary and fine-art photography by amateur and professional photographers in Canada from 1900 to 1945.

Art History 11.560F1 or W1

**Canadian Folk and Popular Arts: Sources and Styles**

This course will examine regional and community-based artistic traditions, particularly those involving immigrants to Canada from Europe and other parts of the world. It will survey sources and styles with particular emphasis on the social context of artistic practice and appreciation.

Art History 11.561F1 or W1

**Canadian Folk and Popular Arts: Critical Readings**

An examination of discourse on folk and popular arts in North America with special reference to Canada, including the relationship between theoretical approaches and exhibition and collection practice, with emphasis on issues of nationalism, regionalism and the influence of the market.

Art History 11.599F4, W4, S4

**M.A. Thesis**

# Ottawa-Carleton Institute of Biology

Herzberg Building 2240  
Telephone: (613) 520-2600  
ext. 8769  
Fax: (613) 520-5613

Université d'Ottawa  
University of Ottawa



Carleton University

## The Institute

**Director of the Institute,** N. Chaly

**Associate Director,** G. Drouin

Students pursuing studies in biological sciences at the M.Sc. and Ph.D. levels in the Ottawa area do so in a co-operative program that combines the resources of the Departments of Biology of Carleton University and the University of Ottawa. The two universities have a joint committee supervising the programs, regulations, and student admissions.

Students are admitted for graduate work under the general regulations of the Institute. Additional criteria for admission include academic performance, research experience, and referees' appraisals. The student must also be accepted by a faculty member who will supervise the research project, and the choice of supervisor will determine the primary campus location of the student. The student's advisory committee will normally include faculty members from both universities.

Requests for information, and completed applications should be sent to the Director or Associate Director of the Institute. Additional information may also be obtained through the Institute website, at [www.carleton.ca/~jhelava/biology/biology.html](http://www.carleton.ca/~jhelava/biology/biology.html)

## Members of the Institute

- J.B. Armstrong, *Developmental Biology*
- J.T. Arnason, *Biochemical Ecology*
- J.M. Blais, *Bio-geochemistry of Toxic Substances*
- Linda Bonen, *Molecular Biology*
- C. Boutin, *Agro-ecosystems, plant conservation, wildlife habitat, herbicides, biodiversity*
- Stephen J. Brooks, *Animal Biochemistry*
- D.L. Brown, *Cell Biology*
- M.J. Canny, *Whole Plant Physiology*
- N. Cappuccino, *Population and Community Ecology*
- G.R. Carmody, *Population Genetics*
- P.M. Catling, *Plant Biosystematics*

- N. Chaly, *Cell Biology*
- François Chapleau, *Fish Evolution*
- Christiane Charest, *Plant Physiology*
- J.J. Cheetham, *Membrane Biochemistry*
- D.J. Currie, *Macroecology, Biogeography*
- J.R. Dillon, *Molecular Genetics*
- Guy Drouin, *Molecular Genetics*
- Lenore Fahrig, *Population Ecology and Ecological Modelling*
- J.M. Farber, *Food Microbiology*
- J.C. Fenwick, *Comparative Endocrinology*
- C.S. Findlay, *Evolution*
- Mark Forbes, *Evolutionary Ecology*
- R.M. Fournay, *DNA Forensics*
- Kathryn Freemark, *Ecology, Behaviour and Systematics*
- A.J. Gaston, *Conservation Biology*
- K.M. Gilmour, *Comparative Respiratory Physiology*
- L. Gillespie, *Systematics and Evolution of Flowering Plants*
- W.D. Gould, *Biotechnology*
- D.A. Hickey, *Genetics and Bioinformatics*
- J.G. Houseman, *Insect Physiology*
- Byron Johnson, *Cell Biochemistry*
- D.A. Johnson, *Molecular Biology*
- Sean W. Kennedy, *Environmental Toxicology*
- Iain Lambert, *Molecular Biology and Genetic Toxicology*
- D.R.S. Lean, *Ecotoxicology*
- C. Martin, *Development Genetics*
- M.E. McCully, *Plant Ultrastructure and Development*
- B.L.A. Miki, *Plant Molecular Biology*
- Pierre Mineau, *Ecotoxicology*
- R.E.J. Mitchel, *Radiobiology*
- T.W. Moon, *Comparative Physiology and Biochemistry*
- Antoine Morin, *Freshwater Ecology*
- Micheline Paulin-Levasseur, *Cell Biology*
- S.B. Peck, *Arthropod and Beetle Evolution Systematics*
- S.F. Perry, *Comparative Respiratory Physiology*
- Bernard Philogène, *Ecophysiology of Insects*

*Chemical Ecology*

- Frances Pick, *Aquatic Ecology*
- Jaroslav Picman, *Behavioural Ecology*
- S. Regan, *Plant Molecular Biology and Genomics*
- C.B. Renaud, *Fish Biology*
- V.L. Seligy, *Molecular Genetics*
- Andrew Simons, *Plant life-history evolution*
- John Sinclair, *Biophysics of Cells*
- Myron Smith, *Fungal Molecular Genetics*
- K.B. Storey, *Biochemical Adaptations*
- Vance Trudeau, *Comparative Endocrinology*
- J.P. Vierula, *Molecular Biology*
- P.R. Walker, *Molecular Mechanisms of Apoptosis*
- P.J. Weatherhead, *Behavioural Ecology*
- Jean-Michel Weber, *Metabolic Physiology*
- R.C. Wyndham, *Microbial Genetics and Ecology*
- Hiroshi Yamazaki, *Bacterial Metabolism, Biotechnology*

## Ottawa-Carleton Specialization in Behavioural Neuroscience

The Departments of Biology and Psychology at Carleton University, and the School of Psychology at the University of Ottawa provide a graduate specialization in behavioural neuroscience at the M.Sc. and Ph.D. level. For further details see p.263.

## Ottawa-Carleton Collaborative Program in Chemical and Environmental Toxicology

The Departments of Biology and Chemistry at Carleton University and at the University of Ottawa provide a collaborative program in chemical and environmental toxicology at the M.Sc. level. For further details see p. 112.

Each campus is well equipped for a wide range of biological research. Some major equipment and facilities include scanning and transmission electron microscopes; confocal laser scanning microscope; digital light microscope and image analysis facilities; conventional and digital darkrooms; animal and plant growth facilities; animal cell culture facilities; electro-physiology equipment; computer systems for genomic studies, modelling of ecological systems, and access to the Internet and the Web; DNA

and protein analysis facilities, including electrophoresis and chromatographic equipment, and ultra-centrifuges. Students also benefit from the resources of nearby government laboratories and libraries, including Agriculture Canada, Environment Canada, Health and Welfare Canada, and the National Research Council.

## Master of Science

### Admission Requirements

An Honours B.Sc. or equivalent degree at a standard acceptable to the two universities is required for admission to the M.Sc. program. Applicants with acceptable standing in a non-honours degree may be admitted to a qualifying-year program which will be determined in each case by the admissions committee.

Applicants must demonstrate a fluent knowledge of English (Carleton), or either English or French (Ottawa).

### Program Requirements

The M.Sc. degree will be conferred upon a candidate who has fulfilled the following requirements:

- \* Completion of the advanced courses specified by the admissions committee and the student's advisory committee; these will range from one to three full (two-term) courses, depending on the background and research program of the student. At least one course at the graduate level must be included, and not more than one course at the Fourth-year honours level (completed while registered as a graduate student) may form part of the candidate's course requirements. The passing grade for all required courses is 70% or the equivalent, and the student is not allowed a supplemental examination. Directed studies or reading courses may not make up more than half of the required number of courses. The admissions committee or the student's advisory committee may also direct the student to take or to audit additional courses. Knowledge of a second language may be specified as a requirement.

- \* Completion of at least two terms as a full-time student resident at one of the two universities is normally required. Programs for part-time students may be arranged.

- \* Presentation of one public seminar on the candidate's thesis research

- \* Completion of a thesis incorporating the results of original research carried out under the direct supervision of an approved faculty member

- \* Successful oral defence of the thesis before an examination board of at least three faculty members, normally drawn from both universities.

## Guidelines for Completion of Master's Degree

The maximum time limits for the completion of the requirements of the master's program are listed in this Calendar in the General Regulations, Section 13 (see p.65.) Full-time candidates in the master's program are expected to complete their degree requirements within six terms of first registration for full-time study. Part-time candidates in the master's program, and candidates who elect to complete their program by a combination of full-time and part-time study, are expected to complete their degree requirements within four calendar years or twelve terms from the initial registration in the master's program.

## Doctor of Philosophy

### Admission Requirements

An M.Sc. from a recognized university is usually required for entry to the Ph.D. program; however, an applicant with a first class B.Sc. and excellent references may be admitted directly to the Ph.D. program. A student already registered for the M.Sc. may be permitted to transfer to the Ph.D. program following a recommendation by the departmental graduate committee and successful completion of the Qualifying Examination required of Ph.D. candidates.

All applicants must demonstrate a fluent knowledge of English (Carleton), or either English or French (Ottawa).

### Program Requirements

The Ph.D. degree will be conferred upon a candidate who has fulfilled the following requirements:

- \* Completion of the courses at the graduate level specified by the admissions and advisory committees; these will range from one to four full courses (two to six courses if admitted without an M.Sc.), depending on the background and research program of the student. Only graduate courses may form part of the candidate's course requirements. The passing grade for all required courses is 70%, and the student is not allowed a supplemental examination. Directed studies or reading courses may not make up more than half of the required number of courses. The admissions committee or the student's advisory committee may also direct the student to take or to audit additional courses. Knowledge of a second language may be specified as a requirement.

- \* Completion of an oral Qualifying Examination within approximately twelve months of entry into the program; this examination will cover the candidate's area of research, and related

topics. The format of the examination will be established by the departmental graduate committee and approved by the admissions committee. The examination committee will generally be composed of faculty members of both universities.

- \* Presentation of at least one public seminar on the candidate's thesis research.

- \* A thesis incorporating the results of original research carried out under the direct supervision of an approved faculty member

- \* Completion of at least four terms as a full-time student resident at one of the two universities (or six terms if admitted without an M.Sc.) is normally required. Under exceptional conditions programs may be arranged for part-time students.

- \* Successful oral defence of the thesis before an examination board of at least five faculty members, with representation from both universities, and including an external examiner from outside the two universities who is an authority on the thesis research area.

## Guidelines for Completion of the Doctoral Degree

The maximum time limits for the completion of the program requirements of the doctoral program are listed in the General Regulations, Section 13. Full-time candidates in the doctoral program are expected to complete their oral Qualifying Examination within approximately twelve months of entry into the program. Part-time candidates in the doctoral program are expected to complete their oral Qualifying Examination within approximately eighteen months of entry into the program. Full-time candidates are expected to complete their degree requirements within four calendar years or twelve terms of registered full-time study. Doctoral candidates who have transferred from the master's to the doctoral program without completing the master's program are expected to complete their degree requirements within four calendar years or twelve terms of registered full-time study from initial registration in the master's program. Part-time candidates in the doctoral program, and candidates who elect to complete their program by a combination of full- and part-time study, are expected to complete their degree requirements within six calendar years or eighteen terms after the date of initial registration.

## Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Biology 61.501F1 (BIO5101)

### **Topics in Biotechnology**

A course concerned with the utilization of biological substances and activities of cells, genes, and enzymes in manufacturing, agricultural, and service industries. A different topic will be selected each year.

Prerequisite: A course in cell physiology or biochemistry, or permission of instructor.

Biology 61.503F1 (BIO5103)

### **Comparative Biochemistry**

Advanced topics emphasizing biochemical structures, functions, and methodologies in the context of animal (invertebrates and vertebrates) adaptations to environmental stress. The course will be offered in alternate years.

Prerequisite: An undergraduate biochemistry course.

Biology 61.509F1, W1 (BIO8124)

### **Ontario Vegetation: Patterns, Processes and Protection**

Patterns of vegetation and plant species distributions in Ontario will be investigated with respect to their origin and maintaining processes. Current methods of protection of significant and representative vegetation using zonal concepts will be considered.

Biology 61.510F1 or W1 (BIO5301)

### **Plant Development**

An advanced course dealing with selected topics in the experimental study of plant development.

Biology 61.515F1 (BIO5302)

### **Methods in Molecular Genetics**

The purpose of this course is to review the fundamental theory and techniques in genetic manipulation of prokaryotes and eukaryotes and to examine some of the innovative new strategies being applied to a variety of problems in molecular biology.

Precludes additional credit for Biology 61.416★ or 61.517.

Prerequisite: Graduate standing and permission of the Department.

Biology 61.516W1 (BIO5308)

### **Laboratory Techniques in Molecular Genetics**

This laboratory course, which is complementary to Biology 61.515, is designed to give students practical experience in many of the important techniques in molecular genetics.

Precludes additional credit for Biology 61.419★ or 61.517.

Prerequisite: Graduate standing and permission of the Department.

Biology 61.521F1 (BIO8301)

### **Evolutionary Genetics and Computer Analyses**

Students will learn the basic concepts in molecular evolution and gain hands-on experience with the computer analysis of DNA sequences. Topics covered will include molecular sequence databases, multiple alignments, amino acid and codon usage, molecular clocks, and phylogenetic trees.

Prerequisites: Graduate standing plus basic courses in genetics and evolution; permission of the Department.

Biology 61.522F1 or W1 (BIO8302)

### **Topics in Evolutionary Genetics**

A lecture/seminar course on the genetic mechanisms and forces responsible for variation and evolutionary change in natural populations. Topics to include protein and genome evolution, molecular phylogenies, DNA sequences in population biology, and the evolution of multigene families.

Prerequisites: Graduate standing plus basic courses in genetics and evolution; permission of the Department (Alternate years)

Biology 61.523F1 (BIO8303)

### **Techniques of Light Microscopy**

An advanced laboratory and lecture course on the principles and techniques of light microscopy.

Precludes additional credit for Biology 61.520 (BIO8238) (if taken before 1997-98).

Prerequisite: Open to Fourth-year and graduate students with consent of the instructor.

Biology 61.524W1 (BIO8304)

### **Techniques of Electron Microscopy**

An advanced laboratory and lecture course on the principles and techniques of electron microscopy.

Precludes additional credit for Biology 61.520 (BIO8238) (if taken before 1997-98).

Prerequisite: Open to Fourth-year and graduate students with permission of the instructor.

Biology 61.525T2 (BIO5204)

### **Plant Physiology and Metabolism**

An advanced course dealing with selected topics in plant physiology and plant metabolism.

Prerequisite: Graduate standing or permission of the Department.

Biology 61.534T2 (PSY6201)

### **Basics of Neuroscience**

A comprehensive neuroscience course from cellular levels to neural systems and behaviour. Topics covered include aspects of neuroanatomy, neurophysiology, neuropharmacology and behavioural and cognitive neuroscience.

(Also listed as Psychology 49.520)

Biology 61.536F1, W1 (BIO9201)

### **Photobiology**

A course dealing with the interaction between light and living organisms, including an introduction to photochemistry, and a detailed study of photosynthesis, vision, photosensitivity, and photoperiodism.

Prerequisite: An advanced course in animal or plant physiology or biochemistry, or permission of the Department.

Biology 61.537F1 or W1 (BIO8122)

### **Advanced Insect Physiology**

Physiological characteristics of insects.

Biology 61.542T1 (BIO8162)

### **Developmental Endocrinology/Topics in Comparative Endocrinology**

A lecture and reading course concerned with classical as well as current topics in the field of comparative endocrinology. Special emphasis is placed on the vertebrates. Offered in alternate years.

Prerequisite: An undergraduate course in endocrinology.

Biology 61.545T2 (BIO9202)

### **Project in Applied Ecology**

A course in the form of a special research project in which the student identifies an environmental problem and the corporate or governmental body that has the power to rectify the problem. (Enrollment is limited).

Biology 61.546F1 or W1 (BIO9303)

### **Advanced Plant Ecology**

Plant population biology, and its usefulness in explaining attributes of plant communities is discussed. During the labs, projects will be carried out to clarify topics such as vegetation classification and competition.

Biology 61.547F1 or W1 (BIO5305)

### **Quantitative Ecology**

A course on analysis of the distribution and abundance of organisms, and of related environmental phenomena.

Prerequisites: Graduate standing, courses in elementary ecology, elementary statistics and biostatistics, and permission of the Department.

Biology 61.549F1, W1 (BIO5306)

### **Mathematical Modelling for Biologists**

This course is designed to develop mathematical tools for the modelling of biological processes. The student is taught the necessary mathematics and a computer language, and guidance is given in the choice of simulation of a biological process.

Biology 61.550T2 (BIO5207)

### **Selected Topics**

Courses in selected aspects of specialized biological subjects not covered by other graduate courses; course details will be available at registration.

Biology 61.551F1 (BIO8100)

### **Selected Topics in Biology I**

Courses in selected aspects of specialized biological subjects not covered by other graduate courses; course details will be available at registration.

Biology 61.552W1, S1 (BIO8102)

### **Selected Topics in Biology II**

Courses in selected aspects of specialized biological subjects not covered by other graduate courses; course details will be available at registration.

Biology 61.553T1 (BIO5901)

### **Recent Advances in Biology**

A course intended for all first-year graduate students to bring them up to date in the various major areas of biology. The course consists of selected readings, lectures, and invited speakers. The course is graded *Satisfactory/Unsatisfactory*.

Biology 61.556F1, W1 (BIO5213)

### **Advanced Insect/Animal Systematics**

A lecture and seminar course concerning methods, roles and advances in systematics of insects and other animals. One research project required.

Prerequisite: A 400-level course in identification or classification of insects or other animals.

Biology 61.558F1 (BIO8306)

### **Advanced Topics in Ecology I**

Lectures, seminars and discussions on current literature on experimental approaches, concepts, and findings in population and community ecology, ecosystem and landscape ecology, and biostatistics. The content complements 61.559 (BIO8307).

Precludes additional credit for Biology 61.548 (BIO9200) (if taken before 1997-98).

Biology 61.559W1 (BIO8307)

### **Advanced Topics in Ecology II**

Lectures, seminars and discussions on current literature on experimental approaches, concepts and findings in population and community ecology, ecosystem and landscape ecology and biostatistics. The content complements 61.558 (BIO8306).

Precludes additional credit for Biology 61.548 (BIO9200) (if taken before 1997-98).

Biology 61.561F1 (BIO5161)

### **Advanced Topics in Insect Evolution**

An exploration of major concepts and questions in insect evolution in the areas of systematics, morphology, the fossil record, biology, and behaviour. The content complements 61.562W1 (BIO5162).

Precludes additional credit for Biology 61.560T2 (BIO5160).

Biology 61.562W1 (BIO5162)

### **Advanced Topics in Insect Evolution**

An exploration of major concepts and questions in insect evolution in the areas of systematics, morphology, the fossil record, biology, and behaviour. The content complements 61.561F1 (BIO5161).

Precludes additional credit for Biology 61.560T2 (BIO5160).

Biology 61.565F1, W1, S1 (BIO5102)

### **Field Course**

Credit for this 0.5 credit course is based on a total of three weeks of field-course modules, involving one or two weeks of intensive and continuous field work with attendant assignments. For details, see coordinator.

Biology 61.579 (BIO 8113)

### **Chemical Toxicology**

An introduction to modeling chemical hazards and exposures at the cellular level. The properties of toxic substances are compared to the responses of enzymatic systems. These interactions are defined as Quantitative Structure-Activity Relationships and used to interpret hazardous materials under regulations such as WHMIS. (Also listed as Chemistry 65.579(CHM 8157))

Prerequisite: Biology 61.642/Chemistry 65.578(BIO 9101/CHM 8156).

Biology 61.581F1 or W1 (BIO5105)

### **Animal Behaviour**

A 0.5 credit course in animal behaviour from an ecological and evolutionary point of view, with additional independent assignments.

Prerequisites: Biology 61.335 and 61.361 or equivalents and registration in a graduate program, or written permission of the Department.

Biology 61.582F1 or W1 (BIO8365)

### **Advanced Behavioural Ecology I**

Recent ideas and research on advanced topics dealing with the evolution of foraging, temporal, spatial, and reproductive strategies are discussed and critically examined. Offered in alternate years.

Biology 61.599F, W, S

### **M.Sc. Thesis**

Biology 61.601F1 (BIO8109)

### **Advanced Molecular Biology I**

Recent advances in molecular biology. Topics for discussion may include: DNA structure and function, the organization of the genome; DNA, RNA and protein synthesis; the regulation of gene expression in eucaryotes and procaryotes. Normally offered in alternate years.

Biology 61.602W1 (BIO8116)

### **Advanced Molecular Biology II**

Recent advances in molecular biology. Topics for discussion may include: mutagenesis and DNA repair; molecular aspects of gene trans-

fer; recombination and gene arrangement; molecular biology as applied to industrial and medical problems. Normally offered in alternate years.

Biology 61.621F1 (BIO8117)

### **Advanced Cell Biology I**

Recent advances in cell biology. Topics for discussion may include: the composition, biosynthesis, deployment three-dimensional organization and functions of the cytoskeleton, the cell-substrate attachment, cell motility, transport of organelles and axoplasmic transport, cell surface and extracellular matrix. Normally offered in alternate years.

Biology 61.622W1 (BIO8118)

### **Advanced Cell Biology II**

Topics for discussion may include: the structure, composition and three-dimensional organization of the nucleus, mechanisms and regulation of genome replication, structure organization of transcription, Nuclear reorganization during gamete development, fertilization, viral infection and the mitotic cell cycle. Normally offered in alternate years.

Biology 61.623 F1,W1

### **Special Topics in Neuroscience**

An in depth study of current topics in neuroscience. Course content varies yearly and has recently included cognitive neuroscience, neuropharmacology, neurodegeneration, behavioural medicine. (Also listed as Psychology 49.630)

Biology 61.624F1,W1,S1 (ANA7400)

### **Neuroscience Techniques**

Completion of a research project carried out under the supervision of a neuroscience faculty member. The student will learn a new neuroscience technique and apply it to a research objective. May be repeated for different projects. Students must obtain approval from the Director of the Neuroscience Specialization. (Also listed as Psychology 49.624)

Biology 61.625F1 or W1 (BIO8319)

### **Advanced Plant Physiology**

A lecture and seminar course dealing with selected topics in advanced plant physiology, available only to graduate students.

Prerequisite: Biology 61.429 or equivalent, or permission of the Department.

Biology 61.627F1 (BIO8164)

### **Ion Channels**

A lecture and seminar course on the physiological and biophysical characteristics of ion channels. Topics are selected from such areas as: determinants of channel selectivity, conformation changes, gating, excitability methods of studying channels and cellular distribution, modulation and development of channels. Offered in alternate years.

Biology 61.630F1 or W1 (BIO8320)

**Advanced Plant Biochemistry**

A lecture and seminar course, available only to graduate students, dealing with selected topics in advanced plant biochemistry.

Prerequisites: Biology 61.425★ and Biology 61.426★/427★, or permission of the Department.

Biology 61.633T2

**Advanced Seminar in Neuroscience**

A seminar focussing on the active research areas and interests of faculty, guest lecturers and graduate students, as well as on current trends in diverse areas of neuroscience. (Also listed as Psychology 49.620)

Biology 61.634F1 or W1 (BIO8361)

**Advanced Topics in Animal Physiology**

In-depth study of areas in animal physiology of current research interest.

Biology 61.641F1 or W1 (BIO8935)

**Recent Advances in Plant Biology**

Special topics of current interest.

Biology 61.642 (BIO 9101)

**Principles of Toxicology**

This course identifies the basic theorems of toxicology with examples of current research problems. Toxic risk is defined as the product of intensive hazard and extensive exposure. Each factor is assessed in scientific and social contexts and illustrated with many types of experimental material. (Also listed as Chemistry 65.578 (CHM 8156))

Biology 61.643

**Ecotoxicology**

Concepts of ecotoxicology, emphasizing whole ecosystem response to hazardous contaminants. The focus is the impacts of chronic and acute exposure of ecosystems to toxicants, the methods of pesticide, herbicide and pollutant residue analysis and the concept of bound residues. (Also listed as Chemistry 65.575 (CHM 9109))

Prerequisite: Biology 61.642/Chemistry 65.578 (BIO 9101/CHM 8156).

Biology 61.644F1 or W1 (BIO8938)

**Plant: Animal Interactions**

Secondary metabolites of plants and their role as attractants or antifeedants to animals and as allelopathic or antifungal agents. Emphasis is placed on co-evolution of plants and phytophagous organisms such as insects and mammals, and the ecological and physiological dimensions of this relationship. Offered in alternate years.

Biology 61.645 (BIO 9105)

**Seminar in Toxicology**

This course introduces the seminar format and involves student, faculty and invited seminar speakers. The student will present a seminar and submit a report on a current topic in toxicology. (Also listed as Chemistry 65.585 CHM 8167))

Biology 61.655F1 or W1 (BIO8108)

**Advanced Topics in Development**

Recent advances in developmental biology. Topics may include embryonic induction, regulation of morphogenesis and differentiation, mechanisms of regional specification and pattern formation, and developmental genetics. Offered in alternate years.

Biology 61.680F1 or W1 (BIO8103)

**Advanced Behavioural Ecology II**

A seminar and laboratory course dealing with current topics in the study of animal behaviour. Prerequisites: Biology 61.581 or equivalent, or permission of the Department.

Biology 61.699F, W, S

**Ph.D. Thesis**

# Ottawa-Carleton Collaborative Program in Biostatistics

Herzberg Physics 4314  
Telephone: (613) 520-2152  
Fax: (613) 520-3536

## The Specialization

**Coordinator, Mathematics and Statistics (Carleton University),** C.W.L. Garner

**Coordinator, Mathematics and Statistics (University of Ottawa),** D.R. McDonald

**Coordinator, Epidemiology (University of Ottawa),** Sankaranarayanan Raman

Biostatistics is an interdisciplinary area of research linking statistics, biology and medicine. This growing area demands knowledge of the theory behind statistical procedures, an ability to put that theory into practice, and an understanding of the areas of application. The applications range from clinical trials to population epidemiology and the development of new procedures.

The Specialization in Biostatistics is intended to prepare a student for a career as a biostatistician in health-related industry, or for a doctoral program in biostatistics. This program takes advantage of several resources particular to the Ottawa area. The Ottawa-Carleton Institute of Mathematics and Statistics offers a strong program in statistics. The Department of Epidemiology and Community Medicine at the University of Ottawa offers a broad range of courses in epidemiology. In addition, there are several research institutes and teaching hospitals in the Ottawa area. These resources provide students with opportunities to develop analytic skills, to interact with practitioners and to work on current research projects in a variety of areas.

The program is administered by a committee of representatives from the primary departments which include: the Department of Epidemiology and Community Medicine at the University of Ottawa, the School of Mathematics and Statistics at Carleton University, and the Department of Mathematics and Statistics at the University of Ottawa.

## Members of the Specialization

The home department of each member is indicated by (C) for the School of Mathematics and Statistics, Carleton University; (UO) for the Department of Mathematics and Statistics, University of Ottawa; (EPI) the Department of Epidemiology and Community Medicine, University of Ottawa.

- Mayer Alvo, *Nonparametric Statistics, Sequential Analysis* (UO)

- N.J. Birkett, *Dynamical Systems in Medicine* (EPI)
- Amitava Bose, *Stochastic Modelling, Probability Theory* (C)
- Miklós Csörgő, *Probability and Statistics* (C)
- A.R. Dabrowski, *Invariance Principles, Weakly Dependent Variables* (UO)
- D.A. Dawson, *Stochastic Processes and Probability Theory* (C)
- Roger Herz-Fischler, *History and Sociology of Mathematics* (C)
- G.B. Ivanoff, *Probability, Point Processes, Martingales* (UO)
- Daniel Krewski, *Applied Statistics in Medicine* (C)
- D.R. McDonald, *Applied Probability* (UO)
- I.W. McDowell, *Health and Aging* (EPI)
- S.E. Mills, *Applied Statistics, Statistical Methods, Inference* (C)
- M. Mojrshiehani, *Resampling, Classification and Pattern Recognition* (C)
- R.C. Nair, *Effects of Blood and Plasma Transfusion on Certain Groups* (EPI)
- Sankaranarayanan Raman, *Cancer Tumour Treatment, Analysis and Meta-analysis of Data from Clinical Trials* (EPI)
- J.N.K. Rao, *Sample Surveys Theory and Methods* (C)
- A.K.Md.E. Saleh, *Order Statistics, Mathematical Statistics* (C)
- Iona Schiopu-Kratina, *Probability Theory, Stochastic Processes* (UO)
- Avi Singh, *Longitudinal Time Series and Methods for their Analysis; Categorical-data Time Series* (C - Adjunct)
- R.A. Spasoff, *Analysis of Clinical Trials* (EPI)
- Barbara Szyszkowicz, *Statistics* (C)
- G.A. Wells, *Clinical Trial Design and Analysis* (EPI)

## Master of Science Admission Requirements

The Specialization is open to suitable candidates enrolled in a master's program in any of the participating departments. There are two streams to the Specialization.

Students requesting admission through the Department of Epidemiology and Community Medicine will normally have an Honours B.Sc.

with high honours standing (or the equivalent) in health sciences or biology, and strong analytic skills. Students admitted through the Department of Epidemiology and Community Medicine follow a program with an emphasis on population or clinical epidemiology.

Students requesting admission through the Ottawa-Carleton Institute of Mathematics and Statistics, either through the University of Ottawa or Carleton University, will normally have an Honours B.Sc. with high honours standing (or the equivalent) in statistics and experience in the analysis of data. Students in this stream follow a program with an emphasis in clinical trial design or epidemiologic methodology.

Students should normally apply for acceptance in the Specialization in Biostatistics at the same time as they apply for admission into the master's program in Mathematics or Epidemiology. If accepted into the regular program, the student will then be considered by the program coordinators for admission into the Specialization. Students intending to apply for admission to the Specialization should normally contact prospective thesis supervisors before submitting the application and establish a thesis supervisor and research topic.

## Program Requirements

In addition to fulfilling the requirements for the master's program of the department in which they are enrolled, all students in the Specialization in Biostatistics must complete one of the two following optional program patterns:

*Master's degree by thesis:*

\* 3.5 credits

\* A compulsory 0.5 credit seminar, Mathematics 70.592(MAT5992)

\* A thesis equivalent to 1.0 credits

Students in the M.Sc. Mathematics program will normally include EPI 5240, EPI5241, EPI6178, EPI6278, MAT5190(70.560), MAT5191(70.551) and another course from the Department of Mathematics and Statistics at the graduate level.

Students in the M.Sc. Epidemiology program will normally include EPI5240, EPI5241, EPI5330, EPI6276, plus two approved courses at the graduate level in Mathematics and Statistics, among their courses.

*Master's degree by course work:*

\* 4.5 credits

\* A compulsory 0.5 credit seminar, Mathematics 70.592(MAT5992)

Students in the M.Sc. Mathematics program will normally include EPI5240, EPI5241, EPI6178, EPI6278, MAT5190(70.560), MAT5191(70.551) and another course from the Department of Mathematics and Statistics at the graduate

level. The degree awarded will in each case specify the discipline of the participating unit with Specialization in Biostatistics.

Most of the program requirements must be fulfilled in English. Students may write papers, submit theses and write examinations in both English and French.

## Thesis

The thesis may contain new research in the area of mathematics and statistics or provide a review of the literature in one area. The thesis will normally be on statistics applied to health or biology; for example, the development of a new statistical procedure, the design of a new experiment or the analysis of data. The thesis should extend beyond the routine analysis of data. The supervisor and other members examination board may be drawn from faculty members in either epidemiology or mathematics and statistics or in other related departments.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Mathematics 70.592 (MAT5992)

### Seminar in Biostatistics

Students work in teams on the analysis of experimental data or experimental plans. The participation of experimenters in these teams is encouraged. Student teams present their results in the seminar, and prepare a brief written report on their work.

### Mathematics and Statistics (see Mathematics and Statistics for course descriptions)

70.560(MAT5190)

70.551(MAT5191)

70.592(MAT5992)

70.599(MAT7999)

### Epidemiology

EPI5240 Epidemiology I

EPI5241 Epidemiology II

EPI6178 Clinical Trials

EPI6278 Advanced Clinical Trials

EPI5330 Vital and Health Statistics

EPI6276 Quantitative Methods in Epidemiology

EPI7999 M.Sc. Thesis

## Business

Dunton Tower 710  
Telephone: (613) 520-2388  
Fax: (613) 520-4427

### The Department

**Director of the School,** Vinod Kumar

**Supervisor of Graduate Programs,** Uma Kumar

The Eric Sprott School of Business offers a program of study and research leading to the degrees of Master of Business Administration and Ph.D. in Management.

### Master of Business Administration

The focus of the M.B.A. program is applied research directed toward the management of technology, productivity, and innovation. The program of study will develop in students the conceptual and methodological skills required to manage, plan, develop, and implement technological capabilities for the purpose of attaining the strategic and operational goals of organizations.

The main areas of specialization within the program are:

- \* Business Information Systems
- \* Finance
- \* International Business
- \* Management
- \* Marketing
- \* Production and Operations
- \* Research and Development Administration

Graduate students in the Eric Sprott School of Business are governed by the General Regulations section of this Calendar. (See p.52).

### Admission Requirements

Admission into the program is judged primarily on the applicant's ability to successfully undertake advanced studies and research in business, his/her prospects for completion of the program, experience, and achievement.

Applicants are required to have the equivalent of an Honours bachelor's degree, with a minimum of high honours standing. Applicants are expected to have credits in mathematics and the following core courses, or their equivalents, in functional areas of business described below:

- \* Business 42.211 : Introduction to Organizational Behaviour
- \* Business 42.228: Introduction to Marketing
- \* Business 42.230: Introduction to Management Science
- \* Business 42.240: Introduction to Information Systems

\* Business 42.254: Essentials of Business Finance

\* Economics 43.220: Statistical Methods in the Social Sciences

In addition, applicants are expected to have an upper-level course sequence in their proposed area of business specialization, and to have an adequate grounding in at least one supporting fundamental discipline such as economics, psychology, sociology, mathematics, anthropology, or computer science.

The School requires that all applicants submit scores obtained in the Graduate Management Admission Test (GMAT) offered by the Educational Testing Services of Princeton, New Jersey. A superior GMAT score will be required for admission. All applicants whose native tongue is not English must take the TOEFL test and obtain a minimum score of 550 (see p.55).

The School's admission policy is governed by the availability of graduate student space. Possession of the minimum admission requirements does not, in itself, guarantee acceptance. Advanced standing may be granted for required courses only if previous work is judged to be equivalent to courses required in the program. Advanced standing and transfer of credit must be determined on an individual basis in consultation with the supervisor of graduate studies and must also be approved at the time of admission by the Dean of the Faculty of Graduate Studies and Research. In general, a grade of B- or better is required in equivalent courses to obtain advanced standing.

### Fast Track M.B.A

Applicants who have:

\* an honours business degree (equivalent to a B.Com. from Carleton University) or the expectation of completing the course requirements for such a degree by May of the year in which they plan to join the M.B.A. program

\* a minimum grade point average (GPA) of 10.0 in their business courses and 9.0 GPA or better overall in their business degree program;

\* successful completion of courses in research methods (equivalent to 42.592, Business Research Methods) and multivariate statistics (equivalent to 42.593, Multivariate Statistics for Business Research)

may apply for admission into the M.B.A. Program,

\* without having to write an otherwise-required GMAT test and

\* may be admitted with an advanced standing of 1.0 credit.

### Program Requirements

The requirement for the Master of Business Administration degree is the equivalent of 5.0 credits of which at least 4.0 credits must be at the 500-level or above. Candidates are re-

quired to select and follow one of the optional program patterns below, chosen in consultation with a graduate advisor:

#### *Thesis Program*

\* 3.5 credits in courses of which 1.5 credits should be from required business courses (42.592, 42.593, 42.597), 1.0 credit from a selection of advanced seminars, and 1.0 credit of approved options as indicated below

\* a Thesis equivalent to 1.5 credits

#### *Research Project Program*

\* 4.5 credits of advanced seminars and approved options, including either 42.592 or 42.593 (as approved by the School). At least 1.5 of the 4.5 credits must be advanced seminars; at least 1.5 credits of the balance of 3 credits must be from graduate courses offered at the School.

\* Research Project (0.5 credit).

Under exceptional circumstances, a student may, with the permission of the School, switch from the Thesis Program to the Research Project Program and vice versa upon completion of appropriate

#### *Advanced Seminars*

\* Business 42.510, 42.520, 42.530, 42.540, 42.550, 42.560, 42.570, 42.580

#### *Approved Options*

Courses which may be selected from those offered by the School or by other academic units, and approved by the School as suitable for the student's program.

### **Thesis**

\* Business 42.599

The M.B.A. thesis is equivalent to 1.5 credits. The thesis normally relates to issues that are relevant to producers and users of technology.

The thesis must represent the result of the candidate's independent research undertaken after being admitted to graduate studies at Carleton University's School of Business. Previous work of the candidate may be used only as introductory or background material for the thesis.

A candidate may carry on research work related to the thesis off campus provided that the work is approved in advance and arrangements have been made for regular supervision of thesis research activities with the School's supervisor of graduate studies.

All students require the School's approval for their proposed thesis topic.

Each candidate submitting a thesis will be required to take an oral examination on the subject of the thesis.

### **Research Project**

\* Business 42.598

The M.B.A. research project is equivalent to 0.5 credit. The research project normally fo-

cuses on a business problem and should involve one or more of the following components: problem analysis and research design; library research and critical analysis; data collection and data analysis. The research project will be carried out under the direct supervision of one or more faculty members of the School. All students require the School's approval for their proposed research project topic. Each candidate submitting a research project will be required to submit a formal research report for evaluation.

### **Academic Standing**

A grade of B- or better must normally be obtained in each credit counted towards the degree. A candidate may, with the recommendation of the School and the approval of the Dean of the Faculty of Graduate Studies and Research, be allowed a grade of C+ in 1.0 credit (or the equivalent).

### **Doctor of Philosophy**

The focus of the Ph.D. program in Management is applied and basic research on complex management problems in a rapidly changing and globally oriented environment. The doctoral program in management is designed to develop graduates skilled in research with both a theoretical and practical understanding of the complex problems of business and managers. These graduates will pursue careers in university education and research, in training and research in private and public sector organizations, and in business management.

The program is designed to accomplish its objectives by its orientation to a holistic, integrative, and discipline-supported approach to management problem-solving, focused on critical issues facing managers in organizations in both the private and public sectors.

The degree will normally be pursued on a full-time basis for the first two years.

### **Admission Requirements**

Admission into the Ph.D. program will be judged primarily on the applicant's ability to undertake research successfully and his/her prospects for completion of the program. Admission to the Ph.D. program is governed by the requirements stated in the General Regulations section of this Calendar.

The normal requirement for admission to the doctoral program in management is a master's degree (or equivalent) in business or a related field with an A- average. A number of years of work experience is desirable.

A student enrolled in the M.B.A. program (or a similar research-based master's program in business) who has completed a minimum of 2.5 credits and who has shown outstanding academic performance and research promise may be admitted to the Ph.D. program without completing the master's program. Normal

Ph.D. program requirements, as stated below, will apply. Each case will be considered on an individual basis for advanced standing in the Ph.D. program. Advanced standing will be considered for a maximum of 1.5 credits.

Applicants who have completed a thesis-based master's program in business or a related area may have their program requirements, as set out below, adjusted at the time of admission.

All Ph.D. candidates, regardless of their previous field of specialization, are expected to have or to acquire a basic knowledge of statistics and at least two of the following areas of management: finance, marketing, organizational behaviour, management science, information systems, and productions/operations management. Students will be admitted to the program with a course of study designed where appropriate to supplement previous education, experience, and training.

The School requires that all applicants submit scores obtained in the Graduate Management Admission Test (GMAT) offered by the Education Testing Service of Princeton, New Jersey. A superior GMAT score will be required for consideration for admission. All applicants whose native tongue is not English must be tested for proficiency in the English language and obtain a minimum score of 550 on the TOEFL.

## Program Requirements

The program requirements for the Ph.D. in Management are:

- \* 10.0 credits comprised of the following: 1.5 credits in research and analysis methods; 1.5 credits of seminar courses in functional areas of business; 1.0 credit from a selection of advanced course electives in the School of Business; and 1.0 credit of free electives which must be approved by the thesis supervisor

- \* A thesis normally equivalent to 5.0 of the 10.0 required credits, which must be defended at an oral examination

- \* Two written and oral comprehensive examinations

- \* Participation in the School of Business seminar series on current business issues for one year

- \* Participation in a seminar series on, and classroom experience in, teaching methods

- \* Presentation and oral defence of the thesis proposal

## Course Requirements

All students in the doctoral program are required to successfully complete:

The following 0.5 credit courses:

- \* Business 42.692, 42.697 and either 42.695 or 42.696. Note: Students who have not successfully completed Business 42.593 (or the equivalent)

must do so before enrolling in Business 42.695.

- \* 1.5 credits of advanced seminars including at least one two-course sequence, from the following doctoral seminar courses: Business 42.610 and 42.611; 42.620 and 42.621; 42.630 and 42.631; 42.640 and 42.641; 42.650 and 42.651.

- \* 1.0 credit from the following list of advanced seminars: Business 42.671; 42.672; 42.673; 42.674; 42.681; 42.682; 42.683; 42.684; 42.685.

Students are strongly encouraged to complete 0.5 credit chosen from Business 42.671, 42.672, 42.673, or 42.674, a series of courses which focuses on the dimensions of complex problem representation and analysis. Students are also strongly encouraged to complete 0.5 credit chosen from Business 42.681, 42.682, 42.683, 42.684, or 42.685, a series of courses oriented to specific management issues.

The remaining 1.0 credit elective, chosen with the approval of the thesis supervisor to assist in the thesis research process, will normally be chosen from either those courses at the 500- or 600-level in the School of Business listed above, or from outside the School in a supporting discipline or in the area of statistics.

## Thesis

All Ph.D. candidates are required to successfully complete a thesis normally equivalent to a minimum of 5.0 credits on a topic approved by the School. Students with appropriate background will be reviewed for possible adjustment of thesis weight.

## Comprehensive Examinations

All Ph.D. candidates are required to successfully complete two written and two oral examinations. One of these examinations will normally cover the functional area specialization of the student. The other examination will normally test the student's ability to integrate and apply knowledge to significant issues in management. The issues dealt with will be distinct from the thesis topic of the student.

The written comprehensive examination may take the form of two major essays, or one major essay and one research grant proposal developed for submission to an agency outside the School. The submission of each essay or grant proposal will be followed within one to three weeks by a comprehensive oral examination, which is not restricted to issues raised by the written portion.

The comprehensive examinations must be completed successfully before the Ph.D. proposal defence is scheduled. In normal circumstances, one oral defence must occur within four calendar terms of the student's initial registration in the Ph.D. program. The second must be de-

fended within six calendar terms of initial registration. Students who do not fulfill this requirement may be asked to withdraw from the program.

## Academic Standing

Doctoral students must normally obtain a grade of B- or better in each credit, and Satisfactory on the comprehensive examinations, the Ph.D. thesis and its oral defence.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Enrolment in graduate courses requires the permission of the School through the supervisor of graduate studies.

Business 42.510F1

### Theories in Organizational Behaviour

Theories and issues related to the management of individuals, teams, and small groups in organizations. Potential topics include personality and individual differences, attitudes, motivation, learning, job design, leadership, communication, decision making, teams and small group behavior, careers, conflict and stress.

Business 42.511W1

### Theories of Organizational Design

A study of theories explaining and shaping the modern organization designs in the technologically advanced countries. Management structures and processes and with potential for meeting the challenges of global economy are analysed

Business 42.520F1

### Seminar in Marketing

Builds awareness of key marketing theory; assesses emerging thinking about the functioning, role, and tools of marketing. Topics emphasized include innovation theory, relationship marketing, new product introduction, marketing in a variety of sectors, such as, technology, services, and government, and the application of technology in marketing,

Business 42.521W1

### Contemporary Marketing Thought

Topics may include the development of paradigms in marketing, business to business marketing, recent advances in consumer behavior,

acquisition of information from the external environment, the influence of societal and environmental developments upon marketing, and new directions in marketing theory and practice.

Business 42.530F1

### Managing the Multinational Enterprise

This course examines issues in the management of Canadian and foreign multinational enterprises, including productivity in multi-site environments, international human resource management, international strategic planning, cross-national business negotiations, and managing cultural differences and their impact on the basic managerial functions.

Business 42.531W1

### Seminar in International Business Management

This course examines current international business topics. These change over time and may include management and marketing across different cultures, market selection and expansion modes, financing and marketing strategies, international diffusion of innovations, free trade blocs, and trends in global and Canadian trade and investment.

Business 42.540F1

### Seminar in Information Systems Management

This course is concerned with major issues in the management of information technology. It covers the following major topics: organization of information services, planning, management, and administration of information resources, assimilation and diffusion of information technology, integration of information services; and current opportunities and concerns in information services.

Business 42.541W1

### Current Topics in Business Information Systems

This course examines trends and issues associated with business information systems within organizations. It covers topics such as analysis and design of information systems, end-user computing, databases, and telecommunications. It may also include topics such as emerging technologies, knowledge-based systems and electronic commerce.

Business 42.550F1

### Seminar in Finance

An analysis of contemporary theory of finance. This analysis includes: the examination of innovations in corporate financing, financial planning, financing strategies, valuation of contingent claims, implications of agency theory, etc. Particular emphasis is placed on financial decision of technology-based firms.

Business 42.551W1

### **Current Topics in Financial Research**

This course examines research and empirical issues in investments, portfolio management, corporate finance, and capital markets. Particular emphasis will be placed on innovative research methods and financial innovations.

Business 42.560F1

### **Seminar in Production and Operations Management**

An introduction to the philosophies, methods, and techniques of modern production and operations management. It discusses design issues involving products, plants, equipment, layout, work organization, and their interrelations. It also discusses operational questions involving the planning and control of production, inventories, and product quality.

Prerequisite: Graduate standing with Business 42.330 or equivalent.

Business 42.561W1

### **Strategic Management of Manufacturing Technology and Productivity**

This course deals with manufacturing strategies related to changes in facilities, location, production technologies, sourcing arrangements and manufacturing infrastructure. Other topics include adoption and implementation of new technologies, and interactions with research and development.

Business 42.570F1

### **Seminar in Management of Research and Development**

Examines the mission of research and development, the management of research and development groups, the creation of technology and its deployment, specific managerial problems in the management of design and development activities, and the basic and applied research which supports these activities.

Prerequisite: Graduate standing with Business 42.330 or equivalent

Business 42.571W1

### **Current Topics in Research and Development and Innovation Diffusion**

Concepts, theories, and methods of efficiently managing the technological innovation cycle, the innovation monitoring system incorporating the critical factors that signal the possible success or failure of a developing project, quality in research and development, technology transfer and models of the diffusion of an innovation.

Business 42.580F1

### **Seminar in Decision Analysis**

The analysis of decisions and the assessment of the quality of management systems based on the decisions they make. Topics include decision making and decision modelling, problem representation, and multi-attribute utility

theory. All theoretical concepts will be illustrated using intuitive examples and practical applications.

Business 42.590T1 or T2

### **Tutorials/Directed Studies in Business**

Tutorials or directed readings in selected areas of business, involving presentation of papers as the basis for discussion with the tutor. A requirement for the course may be participation in an advanced business course at the undergraduate level.

Business 42.592F1

### **Business Research Methods**

A consideration of the basic issues of scientific research as applied to business problems. The course includes a discussion of the logic of scientific research, proof and verification, hypothesis testing, the logic of statistical inference, and research design.

Business 42.593F1

### **Multivariate Statistics for Business Research**

A study of the classical methods of multivariate statistics, including multiple regression, with an emphasis on: assumptions and coping with violations; developing a theoretical understanding of the methods; developing practical computer-based data analysis skills. Provides the background for studying more advanced statistical topics.

Business 42.597W1, S1

### **M.B.A. Thesis Tutorial**

A seminar designed to help the student formulate and evaluate specific research topics. The successful submission of a thesis proposal is necessary for the completion of the course.

Business 42.598F1, W1, S1

### **M.B.A. Research Project**

Business 42.599F3, W3, S3

### **M.B.A. Thesis Research**

Prerequisite: Business 42.597.

Business 42.610F1 or W1

### **Seminar in Modern Organization Theory**

The development of post-structuralist organization theory is examined. Theories of organizational culture and symbolism, political theories of organization, ethnomethodological, decision-based and population ecology approaches are investigated. The social, economic, and intellectual forces shaping organization theory provides a major focus

Business 42.611F1 or W1

### **Current Topics in Organizational Behaviour**

This course examines current topics and debates in the research on organizational behaviour. Potential topics include motivation, learning, communication, decision-making, small group behaviour, leadership, careers, power and conflict.

Business 42.620F1 or W1

**Seminar in Marketing I**

Focuses on marketing theory, history, and current developments through the analysis, synthesis, and extension of theoretical and empirical papers on: the marketing concept, the role of marketing in various types of organizations, defining and segmenting markets; managing new product introductions, established products and marketing planning.

Business 42.621F1 or W1

**Seminar in Marketing II**

This seminar focuses on marketing decision-making practice and theory in business and not-for-profit organizations in such areas as consumer decision-making, organizational decision-making, analytical methods, and research methods to aid in marketing decision-making.

Business 42.630F1 or W1

**Seminar in Management of Production/Operations I: Strategic Management of Production Systems**

The course focuses on developing the firm's strategies with respect to facilities, locations, production technologies, and sourcing arrangements. Also recent developments in management policies and practices that enable the production systems to operate at full potential in the wake of time- and quality-based competition.

Business 42.631F1 or W1

**Seminar in Management of Production/Operations II: Production/Technology/Strategy Interface**

This course deals with the evolution and management of process innovation; management of productivity using production technologies; integration of production strategy and technology; and interactions with research and development. Topics include quality function deployment and the deployment of process innovations.

Business 42.640F1 or W1

**Seminar in Information Systems I: Information and Computing Technologies in Management**

This course deals with research into the role of computing and communications technologies and information systems in the functioning of organizations and managers. Current developments in the information systems field will be analyzed and discussed.

Business 42.641F1 or W1

**Seminar in Information Systems II: Analysis and Design of Information Systems**

This course examines theory and practice concerning factors determining the effective use of computing technologies, particularly on the match between the information systems and its users.

Business 42.650F1 or W1

**Seminar in Finance I**

This course examines selected topics in financial theory. Specific topics are chosen according to new developments in theory and with the interests of the students in mind. These may include theory of derivatives, pricing theory, information asymmetries, agency theory, economic efficiency, and empirical methods.

Business 42.651F1 or W1

**Seminar in Finance II**

A seminar designed to expose students to such emerging areas in finance as total quality management, left-hand financing, activity-based costing, multi-criteria decision-making, neural networks, etc. Integrative problems spanning two or more functional disciplines in management, such as taxation, are also explored.

Business 42.671F1 or W1

**Choice Behaviour**

Examines choice behaviour from a variety of disciplines. Topics covered may include individual choice models in economics, Von-Neumann-Morgenstern utility, Luce Choice Axiom and its extensions, multi-criteria individual choice behaviour, and multi-criteria group choice behaviour.

Business 42.672F1 or W1

**Analysis and Representation of Complex Problems**

This course uses qualitative and quantitative techniques and theoretical frameworks to represent organizational systems, problems and decisions that executives and managers face. The qualitative models are viewed as primary, providing the setting for the quantitative models, selection of choice mechanism, and interpretation of solutions.

Business 42.673F1 or W1

**Systems Concepts in Management**

In this course a unified outlook toward management theory is developed through specifying system variables, components; boundaries and limitations. The importance of computer-based systems for analyzing and managing integrated systems will be examined in the context of control, decision-making and modelling.

Business 42.674F1 or W1

**Managing the Change Process**

This course deals with both the process of organizational change and the external forces which drive such changes. Topics include both micro and macro theories of change and issues around change management such as leadership and resistance to change.

Business 42.681F1 or W1

**Management of Technology**

Introduction to issues in the management of technology. Topics include: technology strat-

egy and policy, technology forecasting and planning, the process of technology innovation from concept to market, research and development management, technology adoption, diffusion and implementation, technology transfer, and technology and social issues.

Business 42.682F1 or W1

### **Women in Management**

This course explores the research and organizational challenges arising from changing gender roles. Topics include: the sex segregation of work, gender differences in management styles, work-family conflict, women's careers, managing sexual harassment, employment equity and pay equity.

Business 42.683F1 or W1

### **Corporate Strategy and Policy**

This seminar focuses on the most important contributions concerning theories of the firm, origins of the modern corporation, analysis of the external environment, industry analysis, value chain analysis, resource-based theory, distinctions between corporate and business strategy, economies of scope, diversification and sustainable competitive advantage

Business 42.684F1 or W1

### **International Business Strategy**

An advanced examination of contemporary theory on international business expansion. Topics include trade and investment flow interactions; expansion modes, location theory, and sequential expansion; globalization, consumer behaviour, and culture; trans-border information flows; internationalization by firm size; strategic alliances; and free trade blocs.

Business 42.685F1 or W1

### **Canadian Business Competitiveness**

Competitiveness at the country, industry, and firm levels, examined in the context of Canada's unique characteristics from various domestic and international perspectives including industrial organization theory, comparative perspectives on industrial concentration, internalization theory, Porter's competitiveness diamond, business-government interactions, and government support programs for business

Business 42.690F1, W1, S1

### **Directed Readings**

Directed readings in selected areas of business, involving presentation of papers as the basis for discussion. A part of the requirement for the course may be participation in an advanced course at the undergraduate/graduate level.

Prerequisite: Permission of the School.

Business 42.691F1, W1, S1

### **Special Topics**

Designed to expose students to new and emerging issues in selected areas of business research. Integrative problems involving two or more areas of business research are also explored. The topics covered may vary from year to year. Prerequisite: Permission of the School.

Business 42.692F1 or W1

### **Research Methodology in Business**

The study of research techniques commonly used in research on business and management issues. The development of knowledge of these methodologies and their application, as well as their possible use in the thesis research of the student are the two main goals of this course.

Business 42.695F1 or W1

### **Advanced Statistical Methods for Business Research**

A practical introduction to advanced statistical methods used in business research, with particular focus on discrete categorical data. Topics include the analysis of two-way and three-way tables; loglinear modelling; logistic regression; generalized linear models. Students will analyze real data using appropriate software packages.

Business 42.696F1 or W1

### **Advanced Methods and Models of Management Science**

Advanced study of decision-making under certainty and uncertainty. Topics include: constrained and unconstrained optimization; project management; scheduling and facilities location; multi-objective dynamic programming; multi-attribute utility theory; discrete choice. Links between theory and application will be illustrated through case studies and applied modelling

Business 42.697F1, W1, S1

### **Ph.D. Thesis Tutorial**

An intensive preparation for Ph.D. thesis research, under the direction of one or more members of the School. The successful submission of a thesis proposal is necessary for the completion of the course.

Business 42.698F2, W2, S2

### **Ph.D. Comprehensives**

Preparation for comprehensive examinations.

Business 42.699F, W, S

### **Ph.D. Thesis**

## Canadian Studies

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Website: [www.carleton.ca/cdnstudies/](http://www.carleton.ca/cdnstudies/)

### The School

**Director,** Natalie Luckyj

**Associate Director,** François Rocher

**Graduate Supervisor,** To be announced

**Coordinator, Heritage Conservation,** Natalie Luckyj

**Coordinator, Canadian Women's Studies,** Katherine Arnup

**Coordinator, Aboriginal Studies and the North,** To be announced

**Coordinator, Cultural Studies,** Natalie Luckyj

**Undergraduate Supervisor,** Madeleine Dion Stout

**Adjunct Professors,** John B. Carroll, David C. Hawkes

**Adjunct Research Professors,** Pat Armstrong, Heather Menzies, James Page

**Fellows,** Richard T. Clippingdale, H. Blair Neatby

The School of Canadian Studies offers a program of study and research leading to the degrees of M.A. and Ph.D. in Canadian Studies.

The work of the School is conducted with the assistance of faculty and availability of course work in a variety of supporting departments including: Architecture, Art History, Economics, English, Film Studies, French, Geography, History, Journalism and Communication, Law, Linguistics and Applied Language Studies, Mass Communications, Music, Political Economy, Political Science, Psychology, Public Administration, Religion, Social Work, Sociology and Anthropology, and Women's Studies.

The Canadian Studies program is interdisciplinary in emphasis. It enables students in the School to develop individual areas of concentration to meet particular interests in a broad range of Canadian issues. The proximity of Carleton University to the National Library, the National Gallery of Canada, the national museums, the Library of Parliament, the National Archives of Canada, Statistics Canada, and the libraries of various government departments and embassies ensures excellent research facilities for graduate candidates in Canadian Studies.

In 1982, with the aid of a grant from the Donner Foundation, the School initiated a program area of northern and Native studies, recently renamed Aboriginal Studies and the North. The same conditions and requirements apply as in other program areas; however, special consideration may be given to candidates for admission who have extensive knowledge of the north or of Aboriginal peoples, and the language requirement may be met by a demonstrated knowledge of an Aboriginal language in addition to English or French.

In 1983-84, a women's studies program area was instituted. Both interdisciplinary and comparative in focus, the program permits students to examine the interplay within the Canadian context between gender and race, gender and nationality, gender and class, and sex/gender as a dynamic principle in the process of imperialism, nation building, and the construction of national and ethnic identities.

Since 1986, the School has offered a program area in Canadian culture and cultural policy. Students with a broad interest in traditional and popular culture, music, art, film, literature, and performing arts will find the program's interdisciplinary approach to cultural theory and practice of great value.

A program area in heritage conservation began in 1989-90. With an interdisciplinary focus on the Canadian natural and built environment, the program permits the course of study to be tailored to individual interest and backgrounds. The School of Architecture, the Department of Leisure Studies at Ottawa University, the Heritage Canada Foundation, and Parks Canada cooperate in offering the program.

A joint Ph.D. degree program with Trent University was approved and introduced in 2000. This program builds on the combined strengths of the existing M.A. programs at the two universities, and provides Canada's only full interdisciplinary doctoral program in Canadian Studies. It has further enriched the graduate offerings by introducing five fields of study: Culture, Literature and the Arts; Environment and Heritage; Policy, Economy and Society; Identities; and Women's Studies.

### Qualifying-Year Program

Applicants who do not qualify for direct admission to the master's program may, in exceptional cases, be admitted to a qualifying-year program. However, admission to the qualifying-year program does not imply automatic admission to the master's program. At the end of the qualifying-year program the student will be required to apply for entry into the master's program, at which time the School will determine the student's eligibility to enter the program.

## Master of Arts

### Admission Requirements

Applicants must normally hold an Honours B.A. (or the equivalent), with at least high honours standing, in one of the disciplines represented in the School. Applicants wishing to be considered for financial assistance from Carleton University are advised to submit completed applications to the School by February 1 since enrolment in the School is limited.

### Language Requirement

The School requires a reading knowledge of French. This requirement may be satisfied in the following ways:

- \* Successful completion of a 100-level French course or its equivalent, preferably French 20.106
- \* Successful completion of a French language examination
- \* Alternatively, a student may fulfill this requirement with a demonstrated knowledge of an Aboriginal language.
- \* The School conducts the French language examinations in September and January. Students choosing the first option should note that examination results in these courses form part of their record, although they are additional to the course requirements for the degree.

### Program Requirements

The minimum requirements for the master's program are outlined in the General Regulations section of this Calendar (see p.52).

The School of Canadian Studies specifies that all candidates must select one of the following program patterns:

- \* 3.0 credits, a thesis, and an oral examination
- \* 4.0 credits, and a research essay
- \* 5.0 credits, and a comprehensive examination in two parts: part one based on 12.501 and part two based on one of 12.511, 12.521, 12.531, 12.532 or 12.541.

Whichever pattern is selected, all students in the master's program are required to take 12.501 and two of the following courses: 12.511, 12.512, 12.521, 12.522, 12.531, 12.532, 12.541, 12.542, 12.551, 12.561.

### Comprehensive Examinations

A committee will be assigned to each candidate choosing the 5.0 credit course option to advise and assist in the preparation for the comprehensive examination. The comprehensive examination will normally be written but may, with the approval of the graduate supervisor,

be oral. The comprehensive examination will normally be undertaken in the academic year in which the student completes 12.501, but, with the approval of the graduate supervisor, may be undertaken at a later point in the student's program.

### Thesis/Research Essay Proposal

Students are required to file with the School a detailed proposal of their thesis or research essay project no later than the end of the second term of registration for students enrolled full-time, and no later than the end of the fifth term of registration for students enrolled part-time. Students failing to file a proposal may not be permitted to register in subsequent terms until this requirement has been met. Approval of proposals shall be the responsibility of the student's intended thesis/research essay supervisor, the graduate supervisor of the School, and the program area coordinator.

### Special Course Offerings in Heritage Conservation Program Area

The School of Architecture offers two workshops in support of the Heritage Conservation Program Area. Students may take these courses as part of their M.A. requirements in Canadian Studies:

- \* Architecture 77.541F1, W1, S1
- \* Architecture 78.542F1, W1, S1

### Ph.D. Program in Canadian Studies (joint program between Carleton University and Trent University)

#### Doctor of Philosophy

The doctoral program is offered jointly by the School of Canadian Studies at Carleton University and the Frost Centre for Canadian Studies and Native Studies at Trent University.

The Ph.D. program offers five fields of study: Culture, Literature, and the Arts; Environment and Heritage; Policy, Economy and Society; Identities; and Women's Studies. The program of courses and thesis guidance, drawing upon the faculty of the two academic units and universities, will encompass course requirements, comprehensive examinations, and a thesis.

The Ph.D. program in Canadian Studies normally will be undertaken on a full-time basis. However, in cases of exceptional merit, the School will accept a few candidates for the degree on a part-time basis.

### Admission Requirements

The normal requirement for admission into the Ph.D. program is a master's degree (or equivalent).

lent), with at least high honours standing, in Canadian Studies or one of the disciplines represented in the School. Applicants should note, however, that meeting the admission requirement does not guarantee admission to the program. Applicants wishing to be considered for financial assistance from Carleton University are advised to submit completed applications to the School by February 1 since enrolment in the School is limited.

## Program Requirements

Doctoral candidates must successfully complete the equivalent of 10.0 credits. Candidates who have deficiencies in certain areas may be admitted to the Ph.D. program, but will normally be required to complete additional work. The specific requirements are as follows:

- \* 1.0 credit for successful completion of 12.690, the mandatory core seminar;
- \* 1.0 credit for successful completion of two half-credit courses or tutorials (or the equivalent) at the graduate level from the list below, with one half-credit course drawn from each of the candidate's two major fields of study; a GPA of 9.0 or better must be obtained in these courses for students to be allowed to proceed to the comprehensive examinations.
- \* 1.0 credit for successful completion of two half-credit written comprehensive examinations. Students will be examined in two fields. Comprehensive examinations are normally written. Comprehensive examinations will be scheduled twice yearly; in September and in January. Normally, students will be expected to complete their comprehensives within 24 months of entering the program.
- \* Satisfactory demonstration of an understanding of a language other than English. Although French is the preferred second language, students may be permitted to substitute an Aboriginal language indigenous to Canada or another language if it is demonstrably relevant to their research interests.
- \* A public defence, in English, of a written thesis proposal. Following the completion of their comprehensives, students will be expected to defend a proposal of the research and analysis they plan to undertake in completing their Ph.D. thesis. The thesis proposal defence should normally occur within six months of a student's comprehensive examinations. The thesis committee will be composed of three faculty, always including one from each university.
- \* A 7.0 credit thesis, which must be successfully defended in English at an oral examination.

## Canadian Studies Courses at Carleton University by Program Field

*Culture, Literature and the Arts*  
12.531, 12.532

*Environment and Heritage*  
12.541, 12.542

*Policy, Economy and Society*  
12.532, 12.551, 12.561

*Identities*  
12.511, 12.512, 12.551

*Women's Studies*  
12.521, 12.522, 12.551

To meet program requirements Carleton students must take at least one of the half-credit courses from the Canadian Studies courses listed above. Students can also choose from approved graduate courses at the Frost Centre for Canadian Studies and Native Studies at Trent University. Students should consult with the Graduate Studies Administrator for the complete listing of acceptable graduate courses available at Trent University in any given year.

Students may also register in graduate courses offered outside Canadian Studies. Please refer to the complete listing of courses which have substantial Canadian content on p. 105.

All graduate courses must be approved by the Ph.D. Coordinator at Carleton University.

## Academic Standing

All Ph.D. candidates must obtain a B+ standing or better (GPA 9.0) in each credit counted towards the degree. Comprehensive examinations (which will be graded on a *Satisfactory, Unsatisfactory* or *Pass with Distinction* basis) are exempted from this required standing.

## Comprehensive Examinations

All Ph.D. candidates must successfully complete a written comprehensive examination in each of their two major fields. The examination is in the form of two examination papers normally written one week apart. Comprehensive examinations are normally written. At the discretion of the School, candidates may be required to take an oral examination following the written examination.

The fields of study for the Ph.D. comprehensive examinations are to be chosen from the following list:

### *Culture, Literature, and the Arts*

A general knowledge of theories of culture in general, Canadian theoretical discourses on cultural practices, and on the interplay among theory, art, and literature, and their social contexts.

**Environment and Heritage**

A general knowledge of locality, landscape, environment and region in Canada.

**Policy, Economy and Society**

A general knowledge of the complex web of relationships linking economy, civil society, and public policy in Canada and their interaction within social, political, and cultural life.

**Identities**

A general knowledge of the character and experience of individual, collective and communal identities in Canada.

**Women's Studies**

A general knowledge of women's experiences of the major dynamics of social, political, economic and cultural development at all levels of Canadian life.

**Thesis Proposal**

All students must publicly defend a thesis proposal after completing their comprehensive examinations. Full-time students must complete this requirement within the first two years of registration in the program.

**Graduate Courses**

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

FW/S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

Students not registered in the M.A. program in the School of Canadian Studies may take interdisciplinary seminars with the permission of the School.

Canadian Studies 12.501F1, W1 or S1

**Concepts of Canada**

Interdisciplinary Seminar. Topic varies from year to year depending on instructor.

Prerequisite: Graduate standing in the School.

Canadian Studies 12.502F1, W1 or S1

**Interdisciplinary Methods**

A survey of the issues raised by problem-directed methodologies; critiques of existing methodology including from the standpoints of feminist and Aboriginal scholarship.

Prerequisite: Canadian Studies 12.501.

Canadian Studies 12.503F1, W1 or S1

**Selected Topics in Canadian Studies**

Topic varies from year to year.

Canadian Studies 12.511F1

**Aboriginal and Northern Issues I**

Interdisciplinary seminar. An examination of the systemic shift Aboriginal Peoples and their northern territories have entered, where material production and good governance have to co-exist with the production of cultural symbols and social relations.

Precludes additional credit for Canadian Studies 12.510.

Canadian Studies 12.512W1

**Aboriginal and Northern Issues II**

Interdisciplinary seminar. Developmental opportunities and constraints and the unique environments, experiences and living conditions which regulate Aboriginal Canada will be covered at micro and macro levels.

Precludes additional credit for Canadian Studies 12.510.

Prerequisite: Canadian Studies 12.511 or permission of the instructor.

Canadian Studies 12.521F1

**Canadian Women's Studies**

Interdisciplinary seminar. An examination of the historical roots and contemporary dimensions of feminist theories and women's movements in Canada.

Precludes additional credit for Canadian Studies 12.520.

Canadian Studies 12.522W1

**Themes in Canadian Women's Studies**

Interdisciplinary seminar. An interdisciplinary seminar focusing on one or more specific themes in Canadian women's studies. Topics may include women's paid and unpaid labour, sexuality, and sexual practices, women's health and reproductive rights, and motherhood.

Precludes additional credit for Canadian Studies 12.520.

Prerequisite: Canadian Studies 12.521 or permission of the instructor.

Canadian Studies 12.531F1, W1 or S1

**Canadian Cultural Studies**

This interdisciplinary seminar studies the arts, belief systems, institutions and communicative practices in Canada in relation to other social and historical structures.

Precludes additional credit for Canadian Studies 12.530.

Canadian Studies 12.532F1, W1 or S1

**Canadian Cultural Policy**

This interdisciplinary seminar examines the evolution of Canadian cultural policy from the Massey Commission through to the search for cultural cohesion within a global context.

Precludes additional credit for Canadian Studies 12.530.

Canadian Studies 12.541F1

**Heritage Conservation: Theory**

This interdisciplinary seminar examines the evolution and current status of conservation theory in Canada, as it affects both cultural and natural resources. Particular attention is given to architectural and cultural landscapes as historical evidence of human interaction with our environment.

Precludes additional credit for Canadian Studies 12.540.

Canadian Studies 12.542W1

**Heritage Conservation: Practice**

This interdisciplinary seminar considers various approaches to the conservation and mise-en-valeur of heritage resources, from scientific conservation to restoration to ritual reinterpretation and adaptive reuse. The seminar includes field exercises.

Precludes additional credit for Canadian Studies 12.540.

Prerequisite: Canadian Studies 12.541 or permission of the School.

Canadian Studies 12.551F1, W1 or S1

**Collective Identities in Canadian Societies**

An interdisciplinary examination of the relationships and conflicts among sex/gender, race, language, ethnicity and nation. Particular emphasis will be given to gendered understandings of racism, nationalism, regionalism, and multiculturalism; and to conflicts between individuals and collective rights claims.

Canadian Studies 12.561F1, W1 or S1

**Policy, Economy and Society in Canada**

This interdisciplinary seminar will focus on relationships linking economy, civil society, and public policy in Canada and their interaction with social, political and cultural life. Themes to be examined include political economy, government moral regulation, community economic development and social change.

Canadian Studies 12.580T2

**Internship/Practicum**

Internships or practicum placements in an institutional setting outside of the University may fulfill up to one course credit. Students are required to complete a formal written paper in addition to their internship/practicum activities. The written work is evaluated jointly by the student's internal and external advisers.

Canadian Studies 12.581F1, S1

**Internship/Practicum**

Internships or practicum placements in an institutional setting outside of the University may fulfill up to one course credit. Students are required to complete a formal written paper in addition to their internship/practicum activities. The written work is evaluated jointly by the student's internal and external advisers.

Canadian Studies 12.582W1, S1

**Internship/Practicum**

Internships or practicum placements in an institutional setting outside of the University may fulfill up to one course credit. Students are required to complete a formal written paper in addition to their internship/practicum activities. The written work is evaluated jointly by the student's internal and external advisers.

Canadian Studies 12.590T2, S2

**Directed Studies**

Reading and research tutorials supervised by a qualified adviser, in an area not covered by an existing seminar. Directed Studies are organized by individual students with a faculty member. Only one credit of directed studies tutorial can be used towards completion of the degree.

Canadian Studies 12.591F1, W1 or S1

**Directed Studies**

Reading and research tutorials supervised by a qualified adviser, in an area not covered by an existing seminar. Directed Studies are organized by individual students with a faculty member. Only one credit of directed studies tutorial can be used towards completion of the degree.

Canadian Studies 12.592T2, S2

**Directed Studies**

Reading and research tutorials supervised by a qualified adviser, in an area not covered by an existing seminar. Directed Studies are organized by individual students with a faculty member. Only one credit of directed studies tutorial can be used towards completion of the degree.

Canadian Studies 12.593F1, W1 or S1

**Directed Studies**

Reading and research tutorials supervised by a qualified adviser, in an area not covered by an existing seminar. Directed Studies are organized by individual students with a faculty member. Only one credit of directed studies tutorial can be used towards completion of the degree.

Canadian Studies 12.598F2, W2 or S2

**Research Essay**

Canadian Studies 12.599F4, W4 or S4

**M.A. Thesis**

Canadian Studies 12.690T2

**Ph.D. Core Seminar: Interdisciplinarity in Canadian Studies: Concepts, Theories & Methods**

An examination of the complex theoretical and methodological issues associated with the discourse on an interdisciplinary study of Canada. It will be offered at Carleton and Trent through a combination of joint sessions at both universities and regular electronic communication.

Canadian Studies 12.691F1, W1 or S1

**Ph.D. Tutorial**

Reading and research tutorials. A program of research and written work in an area not covered by an existing graduate seminar.

Canadian Studies 12.692F1, W1 or S1

**Ph.D. Tutorial**

Reading and research tutorials. A program of research and written work in an area not covered by an existing graduate seminar.

Canadian Studies 12.695 F1, W1 or S1

**Ph.D. Comprehensive Examination**

Available only to Ph.D. Students in Canadian Studies. Students will receive a grade of Satisfactory, Unsatisfactory or Pass with Distinction.

Canadian Studies 12.697 F1, W1 or S1

**Ph.D. Comprehensive Examination**

Available only to Ph.D. Students in Canadian Studies. Students will receive a grade of Satisfactory, Unsatisfactory or Pass with Distinction.

Canadian Studies 12.699F, W or S

**Ph.D. Thesis**

## Selection of Courses

In addition to the graduate courses offered by the School, the following courses are of particular relevance to students in Canadian Studies. The list is not exclusive and is subject to change. Other courses may qualify if the particular professor teaching the course includes substantial Canadian content. Permission of the Graduate Supervisor is required for these courses. Students in the master's program in the School must complete at least 4.0 credits, at the 500-level, with the possibility of 1.0 credit at the 400-level.

*Note:* Students should be aware that the number of spaces in graduate courses offered by other departments may be limited, and that registration may be conditional upon obtaining the prior approval of the department concerned. It is the responsibility of the student to ensure that permission is obtained from the appropriate department prior to registering in any of the department's courses.

### **Anthropology**

54.470 Selected Problems in the Study of North American Native Peoples

54.516, 54.517, 54.538

### **Architecture**

76.423 Society and Shelter

76.500, 76.501, 76.502, 77.541, 78.542

### **Art History**

11.400 Topics in Canadian Art: Art of the Land

11.405 Historic Dress Traditions of Canadian Indian Peoples

11.461 Topics in Twentieth-Century Art: Women Artists and Modernism in Europe and America

11.480 Readings in Twentieth-Century Architectural History

11.490 Directed Readings and Research

11.491 Directed Readings and Research

11.492 Directed Readings and Research

11.500, 11.501, 11.502, 11.511, 11.523

### **Comparative Literary Studies**

17.532, 17.558

### **Economics**

43.436 Employment Economics and Labour Policy

43.480 Urban Economics

43.531, 43.532, 43.533, 43.535, 43.541, 43.542, 43.581, 43.582

### **English Language and Literature**

18.482 Studies in Canadian Ethnic Minority Language

18.483 Studies in the Literature of Quebec and English Canada

18.486 Studies in Canadian Literature I

18.487 Studies in Canadian Literature II

18.488 Canadian Writing and the Literatures of the First Nations

18.581, 18.582, 18.583, 18.585, 18.587, 18.589

### **Film Studies**

19.528, 19.529

### **French**

20.550, 20.570

### **Geography**

45.423 Urban Revitalization

45.427 Urban Development and Analysis

45.431 Advanced Cultural Geography

45.435 Historical Geography

45.447 Canadian Agriculture

45.541, 45.543, 45.545, 45.570, 45.572, 45.573

### **History**

24.422 The Maritimes in Transition, 1870s to 1920s

24.424 Canadian Immigration and Ethnic History

24.426 Perspectives on State Formation in Canada

24.430 Colonial Society in British North America

24.431 Canada from Confederation to the Great War

24.433 Selected Problems in Canadian Business History, 1850-1980

- 24.434 History of Northern Canada
- 24.437 Seminar on Canada From War to War
- 24.438 Studies in the History of Popular Culture
- 24.439 Seminar on Modern Canada Since 1939
- 24.454 Selected Problems in the History of Women and the Family: The Pre-Industrial Atlantic World
- 24.459 Selected Problems in the History of Women and Gender in the Nineteenth and Twentieth Centuries
- 24.500, 24.525, 24.526, 24.529, 24.530, 24.531, 24.532, 24.533, 24.534, 24.535, 24.536, 24.537, 24.556, 24.559, 24.588

**Journalism and Communication**

- 28.500, 28.535, 28.541, 28.550

**Law**

- 51.401 Law, Family and Gender
- 51.402 Feminist Theories of Law
- 51.417 Law in Advanced Capitalist Society
- 51.439 Criminal Proceedings and Dissent: Political Offences And National Security Measures
- 51.445 Labour Relations in the Public Service
- 51.451 Selected Problems in Comparative Constitutional Law
- 51.454 Aboriginal Peoples and the Canadian Criminal Legal System
- 51.457 Administrative Law and Control
- 51.487 Quebec Civil Law
- 51.502, 51.507, 51.508, 51.532, 51.545, 51.550, 51.553, 51.590, 51.591, 51.593, 51.594

**Mass Communication**

- 27.410 Selected Topics in Mass Communication Analysis
- 27.412 Selected Topics in Mass Communication Analysis
- 27.450 Mass Media and Capitalist Democracy I
- 27.451 Mass Media and Capitalist Democracy II
- 27.521, 27.523, 27.525, 27.531, 27.555, 27.556, 27.557, 27.558, 27.559, 27.565

**Music**

- 30.501, 30.505, 30.510, 30.511, 30.512, 30.515

**Political Science**

- 47.400 Topics in Canadian Government and Politics
- 47.402 Policy Seminar: Problems of Northern Development

- 47.403 Politics and the Media
- 47.405 Unity, Disunity and Federalism
- 47.406 Legislative Process in Canada
- 47.407 The Politics of Law Enforcement in Canada
- 47.408 National Security and Intelligence in the Modern State
- 47.409 Quebec Politics
- 47.410 Canadian and Comparative Local Government and Politics
- 47.411 French-English Relations
- 47.416 Labour and the Canadian State
- 47.417 Political Participation in Canada
- 47.418 Canadian Provincial Government and Politics
- 47.419 The Politics of the Canadian Charter of Rights and Freedoms
- 47.424 Elections
- 47.426 Indigenous Politics of North America
- 47.441 Business-Government Relations in Canada
- 47.503, 47.506, 47.507, 47.508, 47.509, 47.510, 47.511, 47.520, 47.521, 47.536, 47.537, 47.541, 47.557, 47.561, 47.600, 47.601

**Public Administration**

- 50.500, 50.504, 50.506, 50.508, 50.509, 50.516, 50.519, 50.525, 50.536, 50.538, 50.560, 50.564, 50.567, 50.571, 50.574, 50.584, 50.586, 50.589

**Social Work**

- 52.412 Aboriginal Peoples and Social Policy
- 52.413 Practice and Policy in Immigration
- 52.423 Social Work Practice from an Aboriginal Perspective
- 52.424 Social Work and Aging
- 52.510, 52.511, 52.512, 52.515, 52.516, 52.518, 52.527, 52.531, 52.532, 52.574

**Sociology**

- 53.451 Workshop in Demography/Human Ecology
- 53.452 Workshop on Work and Organizations
- 53.525, 53.532, 53.538, 53.540, 53.545, 53.568.

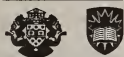
**Women's Studies**

- 09.491 Selected Topics in Women's Studies I
- 09.492 Selected Topics in Women's Studies II
- 09.500, 09.501

# The Ottawa-Carleton Chemistry Institute

Herzberg Building 2240  
Telephone: (613) 520-3515  
Fax: (613) 520-2569

Université d'Ottawa  
University of Ottawa



Carleton University

## The Institute

**Director of the Institute,** R.J. Crutchley

**Associate Director of the Institute,** M. Morin

The Ottawa-Carleton Chemistry Institute, established in 1981, is a joint program of graduate studies and research in chemistry for Carleton University and the University of Ottawa. The Institute combines the research strengths and resources of the Departments of Chemistry at both campuses. Research facilities are shared and include: a major mass spectrometry centre, X-ray spectrometer, several modern NMR spectrometers, a pico-second laser facility, an ultratrace analysis laboratory, and an electrochemical research centre. In addition, the resources of many federal departments are available to graduate students, including the National Research Council and its library, the National Science Library (CISTI), and departments of Health and Welfare and Agriculture.

The Institute offers the M.Sc. and Ph.D. degrees in all areas of chemistry, including biochemistry, analytical, inorganic, organic, physical and theoretical chemistry. All thesis, seminar and examination requirements may be met in either English or French. Students will be enrolled at the campus where the research supervisor is located. Several graduate students also conduct their research off campus under the supervision of one of the Institute's adjunct professors.

Application forms and further information may be obtained by writing to the director of the Institute.

## Ottawa-Carleton Collaborative Program in Chemical and Environmental Toxicology

The Departments of Chemistry and Biology at Carleton University and the University of Ottawa provide a collaborative program in chemical and environmental toxicology at the M.Sc. level. For further details, see p.113.

## Members of the Institute

- Howard Alper, *Organometallic Chemistry*
- Louis Barriault, *Synthetic Organic Chemistry*
- A.D.O. Bawagan, *Chemical Physics*
- D.M. Bishop, *Theoretical Chemistry*

- G.W. Buchanan, *Applications of NMR Spectroscopy*
- P.H. Buist, *Bio-organic Chemistry*
- R.C. Burk, *Environmental and Analytical Chemistry*
- A.J. Carty, *Organometallic and Inorganic Chemistry (Adjunct)*
- C.L. Chakrabarti, *Analytical Chemistry, Environmental Chemistry*
- B.E. Conway, *Electrochemistry and Surface Chemistry*
- R.J. Crutchley, *Physical Inorganic Chemistry*
- Christian Detellier, *Bio-inorganic Chemistry*
- Tony Durst, *Synthetic and Medicinal Organic Chemistry*
- A.G. Fallis, *Synthetic Organic Chemistry*
- D.E. Fogg, *Organometallic, Polymer and Materials Chemistry*
- Sandro Gambarotta, *Inorganic Chemistry*
- B.R. Hollebone, *Chemical Spectroscopy and Chemical Toxicology*
- J.L. Holmes, *Mass Spectroscopy*
- K.U. Ingold, *Physical Organic Chemistry, Free Radicals (Adjunct)*
- Harvey Kaplan, *Biochemistry*
- Peeter Kruus, *Solution Physical Chemistry, Ultrasonics*
- E.P.C. Lai, *Photoacoustic Spectroscopy, Analytical Chemistry*
- Paul M. Mayer, *Gas Phase Ion Chemistry*
- D. Miller, *Environmental Chemistry*
- Mario Morin, *Electrochemistry*
- B.A. Morrow, *Surface Chemistry and Catalysis*
- R.J. Norstrom, *Environmental Chemistry (Adjunct)*
- Arya Prabhat, *Organic (Adjunct)*
- D.S. Richeson, *Inorganic, Solid State and Organometallic Chemistry*
- J.A. Ripmeester, *Colloid and Clathrate Chemistry (Adjunct)*
- R. Roy, *Glycobiology, Combinational and Medicinal Chemistry*
- J.C. Scaiano, *Photochemistry*
- Alain St-Amant, *Theoretical and Computational Chemistry*
- S. Scott, *Surface Chemistry & Catalysis*
- K.B. Storey, *Enzyme Biochemistry, Biotechnology*

- P. (Sundar) Sundararajan, *Morphology of Polymers and Smart Materials*
- Heshel Teitelbaum, *Chemical Kinetics*
- C.S. Tsai, *Enzyme Action and Yeast Cultures*
- Z.Y. Wang, *Synthetic Polymer Chemistry and Organic Chemistry*
- J.S. Wright, *Theoretical Chemistry*

## Master of Science

### Admission Requirements

The normal requirement for admission to the program is an Honours B.Sc. degree in Chemistry, with a B+ average in the last two years and a B average overall. Applicants who do not meet this requirement, or whose undergraduate degree is in another, closely related field, may be accepted into the program, but may be assigned extra courses.

### Program Requirements

- \* A research thesis defended at an oral examination
- \* Two graduate courses (one semester each)
- \* One seminar course (two semesters)

### Guidelines for Completion of Master's Degree

Full-time students in the master's program will normally complete the degree requirements in two years. Part-time students will normally complete the degree requirements in four years.

## Doctor of Philosophy

### Admission Requirements

The normal requirement for admission to the Ph.D. program is a B.Sc. or M.Sc. degree in Chemistry.

### Program Requirements (from B.Sc.)

- \* A research thesis defended before an examination board which includes an external examiner
- \* A comprehensive examination in chemistry; the format of this examination depends on the field of chemistry in which the student is conducting his/her research. At Carleton this normally takes the form of a research proposal. Students who fail to complete the comprehensive examination by the end of their third year in the graduate school will be deregistered from the program.
- \* Four graduate courses (one semester each)
- \* Two seminar courses (two semesters each)

### Program Requirements (from M.Sc.)

Same as above, except that under exceptional circumstances only one seminar course will be required and credit for up to two graduate courses may be given to reduce the requirement for graduate courses from four to two. Students must complete their comprehensive examination within two years or be deregistered from the program.

### Residence Requirements

For the M.Sc. degree:

- \* At least one year of full-time study

For the Ph.D. degree (from B.Sc.):

- \* At least three years of full-time study

For the Ph.D. degree (from M.Sc.):

- \* At least two years of full-time study

### Guidelines for Completion of Doctoral Degree

Full-time students in the doctoral program will normally complete the degree requirements in three years. Part-time students will normally complete the degree requirements in six years.

Full-time students who enter the doctoral program directly from the B.Sc. program will normally complete the degree requirements in four and one-half years. Part-time students will normally complete the degree requirements in nine years.

### Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

Chemistry 65.509 (CHM8150)

**Special Topics in Molecular Spectroscopy**  
Topics of current interest in molecular spectroscopy: electronic spectra of diatomic and triatomic molecules and their interpretation using molecular orbital diagrams; Raman and resonance Raman spectroscopy; symmetry aspects of vibrational and electronic levels of ions and molecules in solids; weak and strong resonant laser radiation. (Also listed as Physics 75.522/PHY8122)

Chemistry 65.511 (CHM8181)

**Chemical Physics of Electron-Molecule Collisions**

Basic classical scattering theory and quantum mechanical scattering theory. Experimental as-

pects, such as electron optics, electron gun fundamentals, energy analyzers and electron detectors. Applications to the understanding of the chemistry of materials.

Chemistry 65.512 (CHM8172)

### **Supercritical Fluids**

Fundamental and practical aspects of the uses of supercritical fluids in the chemistry laboratory. Thermodynamic treatment of high pressure multicomponent phase equilibria, transport properties, solubilities, supercritical fluid extraction and chromatography for analytical purposes, reactions in supercritical fluids, equipment considerations, new developments.

Chemistry 65.515 (CHM8171)

### **Computational Chemistry**

Introduction to the theory, limitations, and applications of molecular mechanics, molecular dynamics, Monte Carlo techniques, genetic algorithms, semi-empirical molecular orbital methods, and density functional methods. Introduction to the Unix operating system, the internet, and hardware and software considerations.

Chemistry 65.516 (CHM8170)

### **Quantum Chemistry**

Molecular orbital theory and its application to chemistry. Self-consistent field method, results for diatomic molecules. Configuration interaction and molecular dissociation. Basis sets and molecular properties. Ab initio versus semi-empirical approaches. Correlation diagrams for chemical reactions. Polyatomic molecules and potential energy surfaces.

Chemistry 65.517 (CHM8161)

### **Physical Chemistry of Solutions**

Major theoretical approaches and experimental methods used in the study of liquids and solutions.

Prerequisite: A reasonable background knowledge in thermodynamics, quantum chemistry, and statistical mechanics.

Chemistry 65.519 (CHM 8149)

### **Molecular Reaction Dynamics**

State-to-State versus bulk reaction kinetics. Trajectory approach to molecular reaction dynamics. Important experimental techniques: molecular beam reactions, infrared chemiluminescence, laser-induced fluorescence, reaction mechanisms.

Chemistry 65.520 (CHM8152)

### **Surface Chemistry and Catalysis**

Adsorption phenomena and isotherms, surface area of solids. Modern techniques in surface chemistry and surface science such as electron diffraction, Auger electron spectroscopy, photo-electron spectroscopy, electron energy loss spectroscopy, infrared and Raman spectroscopy. Current new techniques.

Chemistry 65.522 (CHM8131)

### **Physical Chemistry of Electrolytic Solutions**

Properties of water, hydration of ions, ionic interaction, colloidal and polymeric electrolytes. Ionization processes in solution.

Chemistry 65.523 (CHM8141)

### **Applied Electrochemistry**

Selected topics in applied electrochemistry will be reviewed, including metal electrodeposition, organic electrochemistry, performance of batteries, electrochemical energy conversion, corrosion and passivity. Electrochemistry at semiconductors.

Chemistry 65.524 (CHM8151)

### **Electrochemistry at Interfaces**

Introduction to electrode processes and electrolysis. Potential differences at interfaces. Characterization of the electrical double layer. Dipole orientation effects; charge transfer in adsorbed layers; electrochemical origins of surface science concepts. Theory of electron transfer; electrode kinetics; electrocatalysis. Industrial applications; photo-electrochemistry.

Chemistry 65.527 (CHM8121)

### **Organic Reaction Mechanisms**

Advanced physical organic chemistry, including topics such as: acidity functions, pK<sub>a</sub>s of organic compounds, steric and electronic effects in organic chemistry, molecular orbital theory and correlation diagrams, structure calculations using molecular mechanics.

Chemistry 65.528 (CHM8133)

### **Multinuclear Magnetic Resonance Spectroscopy**

Principles of Nuclear Magnetic Resonance (NMR). NMR parameters: chemical shift, spin-spin coupling, electric quadrupole coupling, spin-spin and spin-lattice relaxation rates. NMR and the periodic table. Dynamic NMR. Applications in chemistry and biochemistry. The Fourier Transform technique. Pulse sequences. Basic principles and applications of two-dimensional NMR.

Chemistry 65.529 (CHM8154)

### **Reaction Intermediates**

The basic principles of photo-chemistry in condensed phases as a method for the generation of reactive intermediates. Topics include: excited states, free radicals, carbenes, biradicals, enols, carbocations and zwitterionic intermediates. The techniques include laser and conventional flash photolysis, pulse radiolysis, esr, CIDNP and matrix isolation.

Chemistry 65.530 (CHM8159)

### **Total Synthesis: Strategies and Case Studies**

General procedures for the total synthesis of natural products. Retrosynthetic planning, choice of starting materials, multiple bond construction, stereochemical considerations and choice of strategies Analyses of recent syntheses.

ses. Comparison of alternative solutions emanating from different laboratories. Pericyclic reactions, free radical cyclizations

Chemistry 65.531 (CHM8160)

**Chiron Approach to Natural Product Syntheses**

Retrosynthetic analysis and description of natural product total synthesis through the chiron strategy with emphasis on carbohydrates and amino acids as chiral building blocks. Macrolides and polyethers. Diversity in carbohydrates; chiral templates, selective manipulations. Aspects of protecting group chemistry, stereoelectronic effects, chirality induction and transfer.

Chemistry 65.532 (CHM8132)

**Enzymology and Protein Chemistry**

Basic principles of structure-function relationships in proteins. Chemical nature of polypeptides and the folded conformation of proteins. Enzymatic catalysis; protein engineering.

Chemistry 65.533 (CHM8126)

**Bioorganic Chemistry**

Overview of recent developments in the general area of biocatalysis. Current examples of the biotransformation of organic compounds using enzyme models, abzymes, enzymes, immobilized enzymes, microbial cells and recombinant microbial cells. Biosynthetic procedures of industrial importance in waste management.

Chemistry 65.537 (CHM8169)

**Chemistry of the Transition Metals**

Bonding in transition metal complexes: V.B. treatment, crystal field, ligand field, Jahn-Teller effect, spectrochemical series. Nomenclature. M-M bonds, zerovalent clusters, medium valent clusters. Descriptive chemistry. Activation of small molecules, agostic interactions. Theoretical background. Olefin activation. Theoretical background, metathesis, polymerization, isomerization, carbonylation, insertion reactions. Environmental catalysis.

Chemistry 65.538 (CHM 8168)

**Solid State Chemistry**

Thermodynamic and kinetic aspects of solid state synthesis. Spectroscopic and structural characterization of solids. Chemical and physical properties of solids including intercalation reactions, ionic conductors, glasses, electronic, magnetic, optical, and physical/mechanical properties.

Chemistry 65.539 (CHM8144)

**Electron Transfer Reactions: Theory and Experiment**

Development of electron transfer theory from classical, semi-classical to quantum mechanical treatments. Recent experimental results

related to classical Marcus electron transfer theory and the application of electron transfer theory to biological processes.

Chemistry 65.540 (CHM8114)

**Special Topics in Non-Metal Chemistry**

Topics of current interest in non-metal chemistry. The content of this course may vary from year to year.

Chemistry 65.541 (CHM8117)

**Organometallic Chemistry**

Bonding and reactions of compounds containing organic ligands bound to metals through one to eight carbons. Industrial processes (olefin meta-thesis, the OXO process, the Monsanto acetic process)-biological processes (reactions catalyzed by coenzyme B12). Transition metal chemistry, including synthesis and mechanisms physical techniques.

Chemistry 65.542 (CHM8115)

**Special Topics in Inorganic Chemistry**

Topics of current interest in inorganic chemistry. Ceramics: binary and ternary phase diagrams and their thermodynamic basis; pyrometallurgical and ceramic thermochemistry; glasses; molten salts and solid solutions; defects; doping and preparation of pure materials; electrical and surface properties of ceramics.

Chemistry 65.543 (CHM8112)

**Methods in Analytical Chemistry**

This course describes the criteria used in choosing the best analytical technique for specific problems including accuracy, precision, sensitivity, linearity, detection limits, interferences and the commercial availability of suitable instrumentation for analysis by atomic spectroscopy, electro-chemistry, chromatography, molecular spectrometry and mass spectrometry.

Chemistry 65.544 (CHM8125)

**Organic Synthesis (Carbanion Chemistry)**

Recent developments in the use of carbanion chemistry for the making of carbon-carbon and carbon-heteroatom bonds. Chiral syntheses, methods of generating carbanions, kinetic versus thermo-dynamic acidity, heteroatom-stabilized carbanions, the aldol and related condensations, Michael addition reactions, and ortho-metalation in aromatic systems.

Chemistry 65.545 (CHM8166)

**Advanced Carbohydrate Chemistry**

Medicinal organic chemistry related to carbohydrates. New glycosylation strategies in the design of O, C, N, S and P-glycosyle derivatives. Nucleotides and glycopeptides synthesis. Glycoconjugate synthesis and their immunochemical significance as vaccines, diagnostics and cell targeting systems. Glycopolymer preparations. Biological roles of carbohydrates.

Chemistry 65.546 (CHM8164)

### **Organic Polymer Chemistry**

Basic principles of industrial and synthetic polymers. Polymerization and polymer characterization. Selected topics to cover some important polymers with emphasis on the synthesis, commodity plastics, engineering thermoplastics and specialty polymers. Also offered at the undergraduate level, as Chemistry 65.424, for which additional credit is precluded.

Prerequisites: Chemistry 65.321 and 65.322 and/or 65.423 or the equivalent. Students should have a basic knowledge of organic reaction mechanisms and stereochemistry.

Chemistry 65.547 (CHM8134)

### **Spectroscopy for Organic Chemists**

Analysis of proton NMR spectra. Fourier transform <sup>13</sup>C NMR, strategies for structure elucidation relaxation times, two-dimensional NMR. Aspects of mass spectrometry. Also offered at the undergraduate level, with different requirements, as Chemistry 65.442, for which additional credit is precluded.

Chemistry 65.548 (CHM8122)

### **Special Topics in Organic Chemistry**

Topics of current interest in organic chemistry. Solid state NMR: chemical aspects of solid state structure; molecular ordering and motion in the solid state; magnetic interactions; hydrogen, deuterium and <sup>13</sup>C NMR; experimental methods; applications; relationship between high resolution solid-state and solution NMR.

Chemistry 65.549 (CHM8123)

### **Recent Advances in Organic Chemistry**

Topics of current interest will be discussed.

Chemistry 65.550 (CHM8116)

### **Analytical Instrumentation**

Principles of modern electronic instrumentation and their application, measurement and control systems; microcomputer interfacing. Instrumentation concepts including feedback control, signal-to-noise enhancement, data acquisition, signal processing. A parallel laboratory uses modern test instruments. Examples include absorption spectrophotometer, derivative titration thermocouple, pH meter, and cyclic voltammetry

Chemistry 65.552 (CHM8110)

### **Analytical Approach to Chemical Problems**

Case-study approach to problems in agricultural, biochemical, environmental, food processing, geological, industrial and surface sciences, capillary electrophoresis, chemiluminescence, electrochemical biosensors, Fourier transform infrared spectroscopy, inductively coupled plasma emission, neutron activation analysis, sensor arrays, secondary ion mass spectrometry, tandem mass spectrometry, NMR, ultra-high resolution spectroscopy, pattern recognition.

Chemistry 65.553 (CHM8108)

### **Analytical Mass Spectrometry**

Basic mass spectrometry and gas phase ion chemistry; instrumentation currently available and the principles of operation, methods of ionization; separation techniques, and the obtaining and interpretation of data. The relationships between mass spectra and chemical structure are also examined.

Chemistry 65.555 (CHM8119)

### **Advanced Ultratrace Analytical Chemistry**

Criteria for evaluation and selection of analytical techniques and methods. Simultaneous and sequential multielement analysis. Atomic absorption, atomic emission and atomic fluorescence spectrometry, using optical spectrometric and mass-spectrometric determination. Electroanalytical techniques. Applications of these techniques at trace and ultratrace levels in complex matrices.

Chemistry 65.556 (CHM8120)

### **Environmental Analytical Chemistry of Inorganic Systems**

Sampling of the atmospheric and aquatic environments. Sampling artifacts and blanks in the sub-parts-per-trillion concentration levels. Analytical techniques and methods for quantitative determination of analytes in elemental and isotopic form. Analytes in molecular form and analytical techniques for chemical speciation. Speciation schemes

Chemistry 65.557 (CHM8162)

### **Environmental Organic Chemistry**

Methods for determination of organic analytes in environmental systems. Sampling, sample treatment, measurement, quality control, and data significance. Application to such environmentally important analytes as PCBs, dioxins, pesticides, herbicides, trihalo- methanes, and polycyclic aromatic hydrocarbons. Rationale and selection of specific methods.

Chemistry 65.558 (CHM8163)

### **Special Topics in Analytical Chemistry**

Topics of current interest in analytical chemistry. The content of this course may change from year to year.

Chemistry 65.570 (CHM8143)

### **Special Topics in Physical Chemistry**

Topics of current interest in physical chemistry. The content of this course may change from year to year.

Chemistry 65.571 (CHM8145)

### **Photochemistry**

Photochemical reactions of small molecules and the relation to atmospheric chemistry. Lasers and applications to measurements of the dynamics of elementary reactions. Production and detection of reactive species. Energy transfer processes. Photolysis of formaldehyde and carbonyl compounds. Multiphoton absorption of infrared radiation.

Chemistry 65.572 (CHM8135)

**Theories of Chemical Reaction Rates**

Concepts and theories of chemical kinetics. Significance of activation energy; transition state theory and more modern developments; reaction dynamics. Other optional topics include unimolecular gas reactions, theory of solvent effects, homogeneous and heterogeneous catalysis, and kinetic isotope effects.

Chemistry 65.573 (CHM8137)

**Advanced Chemical Kinetics**

Study of the principles involving the exchange of translational, rotational, vibrational and electronic energy in molecular collisions. Influence of energy transfer processes on thermal unimolecular and biomolecular reactions. Study of the relationship between microscopic and macroscopic kinetics of elementary reactions.

Chemistry 65.574 (CHM8142)

**Symmetry in Chemistry**

Introduction to group theory with emphasis upon irreducible representations. Application to molecular vibrations, molecular orbital theory and transition metal chemistry.

Biology 61.643/Chemistry 65.575 (BIO9104/CHM9109)

**Ecotoxicology**

Concepts of ecotoxicology, emphasizing whole ecosystem response to hazardous contaminants. The focus is the impacts of chronic and acute exposure of ecosystems to toxicants, the methods of pesticide, herbicide and pollutant residue analysis and the concept of bound residues.

Prerequisite: Biology 61.642/Chemistry 65.578 ((BIO9101/CHM8156))

Chemistry 65.576 (CHM8148)

**Gas Phase Ion Chemistry**

Structure, energetics and reaction kinetics of ions in the gas phase. Small organic ions, chemistry of free radicals, hypervalent species. Contemporary experimental methods in the physical chemistry of fast ion beams. Recent work on novel ions and neutral species of relevance to interstellar chemistry.

Chemistry 65.577 (CHM8138)

**Enzyme Kinetics and Mechanism**

Kinetic studies of enzymic reactions. Enzyme efficiency, specificity and versatility. Mechanisms and regulation of enzymic reactions. Analyses of enzymic systems.

Chemistry 65.578 (CHM8156)

**Principles of Toxicology**

This course identifies the basic theorems of toxicology with examples of current research problems. Toxic risk is defined as the product of intensive hazard and research problems. Each factor is assessed in scientific and social contexts and illustrated with many types of experimental material. (Also listed as Biology 61.642 (BIO9101))

Chemistry 65.579 (CHM8157)

**Chemical Toxicology**

An introduction to modeling chemical hazards and exposures at the cellular level. The properties of toxic substances are compared to the responses of enzymatic systems. These interactions are defined as Quantitative Structure-Activity Relationships and used to interpret hazardous materials under regulations such as WHMIS. (Also listed as Biology 61.579 (BIO8113))

Prerequisite: Biology 61.642/Chemistry 65.578 (BIO9101/CHM8156).

Chemistry 65.581 (CHM8256S)

**Seminar I**

Chemistry 65.582 (CHM8257S)

**Seminar II**

Chemistry 65.585 (CHM8167)

**Seminar in Toxicology**

This course introduces the seminar format and involves student, faculty and invited seminar speakers. The student will present a seminar and submit a report on a current topic in toxicology. (Also listed as Biology 61.645)

Chemistry 65.590 (CHM8158)

**Directed Special Studies**

Under unusual circumstances and with the recommendation of the research supervisor, it is possible to engage in directed study on a topic of particular value to the student. This may also be used for credit if there are insufficient course offerings in a particular field.

Chemistry 65.599 (CHM7999)

**M.Sc. Thesis**

Chemistry 65.699 (CHM9999)

**Ph.D. Thesis**

# Ottawa-Carleton Collaborative Program in Chemical and Environmental Toxicology

Herzberg Building 2240  
Telephone: 520-3515  
Fax: 520-2569

## The Program

**Associate Coordinator of the Collaborative Program**, B.R. Hollebone, Department of Chemistry, Carleton University

Toxicology is the study of the effects of poisons on living systems. These poisons can be either inorganic, synthetic, or natural organic materials. As a field of research, toxicology cuts across traditional disciplinary boundaries such as chemistry, biology. While individual researchers usually specialize in a particular area, toxicologists today must be able to appreciate significant research in other fields and therefore require an understanding of the basic principles of other disciplines. To meet this challenge, Carleton University and the University of Ottawa offer a multidisciplinary Collaborative Program in Chemical and Environmental Toxicology as a Specialization in Toxicology of the Master of Science degree offered in the two joint Institutes: The Ottawa-Carleton Institute of Biology, which consists of the Departments of Biology at Carleton University and the University of Ottawa; The Ottawa-Carleton Chemistry Institute, which consists of the Departments of Chemistry at Carleton University and the University of Ottawa.

The Collaborative Program is coordinated by a committee of representatives of these participating units. The Program is intended to focus the research and training which the student receives through either of these Institutes onto the specific, interdisciplinary problems of toxicology. The student is responsible for fulfilling the requirements of both the Master of Science degree in the chosen Institute and the additional requirements of the Collaborative Program. The Master of Science degree awarded will specify the discipline of the Institute, with the additional annotation of the Specialization in Chemical and Environmental Toxicology.

To enter the Program, students would first apply directly to the Institute which is most appropriate to their research interests. Once accepted into this chosen Institute, students may then apply to the Collaborative Program to undertake relevant course work and research for the Specialization in Toxicology. Further information can be obtained from the Coordinator or Associate Coordinator or the Directors or Associate Directors of the Biology or Chemistry Institutes.

## List of Coordinators and Members of the Collaborative Program in Chemical and Environmental Toxicology

**Coordinator of the Collaborative Program**, D. Lean, Department of Biology, University of Ottawa

**Associate Coordinator of the Collaborative Program**, B.R. Hollebone, Department of Chemistry, Carleton University

## Members of the Collaborative Program;

- Arnason, J.T., Ph.D., *Plant secondary chemicals, plant-insect interactions*, Ottawa-Carleton Institute of Biology, University of Ottawa.
- Bawagan, A.D.O., Ph.D., *Physical Chemistry*, Ottawa-Carleton Chemistry Institute, Carleton University.
- Burk, R., Ph.D., *Environmental Analytical Chemistry*, Ottawa-Carleton Chemistry Institute, Carleton University.
- Chakrabarti, C.L., Ph.D., D.Sc., *Environmental Toxicology*, Ottawa-Carleton Chemistry Institute, Carleton University (Distinguished Research Professor)
- Charest, C., Ph.D., *Plant Eco-Physiology*, Ottawa-Carleton Institute of Biology, University of Ottawa.
- Findlay, C.S., Ph.D., *Modeling of toxicant transport*, Ottawa-Carleton Institute of Biology, University of Ottawa.
- Gardner, D.R., Ph.D., *Pesticide-nerve interactions*, Ottawa-Carleton Institute of Biology, Carleton University.
- Hollebone, B.R., Ph.D., *Chemical Toxicology*, Ottawa-Carleton Chemistry Institute, Carleton University.
- Kennedy, S.W., Ph.D., *Environmental Toxicology*, Ottawa-Carleton Institute of Biology, University of Ottawa. (Adjunct)
- Lai, E.P.C., Ph.D., *Analytical Chemistry*, Ottawa-Carleton Chemistry Institute, Carleton University.
- Lambert, I.B., Ph.D., *Genetic Toxicology, Biochemistry*, Ottawa-Carleton Institute of Biology, Carleton University.
- Lean, D.R.S., Ph.D., *NSERC Industrial Chair in Ecotoxicology*, Ottawa-Carleton Institute of Biology, University of Ottawa.

- Miller, J.D., Ph.D., *Environmental Toxicology of Natural Toxins*, Ottawa-Carleton Chemistry Institute, Carleton University.
- Mineau, P., Ph.D., Adjunct Professor, *Wildlife and Pesticide Toxicology*, Ottawa-Carleton Institute of Biology, Carleton University.
- Mitchel, R.E.J., Ph.D., *Radiation Toxicology*, Ottawa-Carleton Institute of Biology, University of Ottawa. (Adjunct)
- Moon, T.W., Ph.D., *Comparative Physiology, Biochemistry*, Ottawa-Carleton Institute of Biology, University of Ottawa.
- Philogene, B.J.R., Ph.D., *Insect Physiology, Chemical Ecology*, Ottawa-Carleton Institute of Biology, University of Ottawa.
- Pick, F.R., Ph.D., *Aquatic Sciences, Microbial Ecology*, Ottawa-Carleton Institute of Biology, University of Ottawa.
- Scaiano, J.C., Ph.D., *Physical Organic Chemistry, Photochemistry*, Ottawa-Carleton Chemistry Institute, University of Ottawa.
- Scott, S.L., Ph.D., *Surface Chemistry, Kinetics*, Ottawa-Carleton Chemistry Institute, University of Ottawa.
- Trudeau, V.L., Ph.D., *Physiology and Toxicology of Reproduction*, Ottawa-Carleton Institute of Biology, University of Ottawa.
- Wigfield, D.C., Ph.D., *Chemical Toxicology*, Ottawa-Carleton Chemistry Institute, Carleton University.
- Wyndham, R.C., Ph.D., *Molecular Microbial Ecology*, Ottawa-Carleton Institute of Biology, Carleton University.

## Master's Program

### Admission Requirements

Admission to the Collaborative Program in Chemical and Environmental Toxicology, leading to the Specialization in Toxicology of the Master of Science in Biology or Chemistry is considered after the student has been admitted to the Master of Science program of one of the participating Institutes. Acceptance is normally based on:

\*A high honours GPA in the undergraduate degree or in graduate course work.

\*A letter of recommendation from a faculty member participating in the Collaborative Program, which both recommends admission and indicates the willingness of the faculty member to supervise and sponsor the candidate's research program in a relevant field of chemical and/or environmental toxicology.

## Program Requirements

Students must fulfill the Master of Science degree requirements for the Institute in which they are enrolled. To qualify for the additional Specialization of the degree, the following specific courses are required:

\*Biology 61.642/Chemistry 65.578 (BIO 9101/CHM 8156) (0.5 credit)

\*Biology 61.645/Chemistry 65.585 (BIO 9105/CHM 8167) (0.5 credit)

\*One additional Toxicology course (0.5 credit) chosen from;

\*Biology 61.643 (BIO 9104)

\*Chemistry 65.579 (CHM 8157)

\*One course approved by the Coordinator or Associate Coordinator (0.5 credit)

Other courses offered in the programs of the primary Institutes may be taken as options, with the permission of the student's supervisory committee, in addition to these basic requirements of the Collaborative program in Chemical and Environmental Toxicology. As necessary, the Institute may also direct the student to take or audit additional courses to complement background knowledge.

The student is also required to present a research thesis on a topic in a relevant aspect of chemical or environmental toxicology. This relevance must be identified clearly in the written thesis.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

Other courses listed in the calendar under the primary academic units of psychology, biology, or chemistry may be taken, with the approval of the student's supervisory committee, as options in addition to the basic requirements of the degree in chemical and environmental toxicology.

Course numbers refer to Carleton University (University of Ottawa) listings of the Institutes.

Biology 61.642/Chemistry 65.578  
(BIO9101/CHM8156)

### Principles of Toxicology

This course identifies the basic theorems of toxicology with examples of current research

problems. Toxic risk is defined as the product of intensive hazard and extensive exposure. Each factor is assessed in scientific and social contexts and illustrated with many types of experimental material.

Biology 61.643/Chemistry 65.575  
(BIO9104/CHM9109)

#### **Ecotoxicology**

Concepts of ecotoxicology, emphasizing whole ecosystem response to hazardous contaminants. The focus is the impacts of chronic and acute exposure of ecosystems to toxicants, the methods of pesticide, herbicide and pollutant residue analysis and the concept of bound residues.

Prerequisite: Biology 61.642/Chemistry 65.578  
(BIO9101/CHM8156)

Biology 61.645/Chemistry 65.585  
(BIO9105/CHM8167)

#### **Seminar in Toxicology**

This course introduces the seminar format and involves student, faculty and invited seminar speakers. The student will present a seminar and submit a report on a current topic in toxicology.

Biology 61.579/Chemistry 65.579  
(BIO8113/CHM8157)

#### **Chemical Toxicology**

An introduction to modeling chemical hazards and exposures at the cellular level. The properties of toxic substances are compared to the responses of enzymatic systems. These interactions are defined as Quantitative Structure-Activity Relationships and used to interpret hazardous materials under regulations such as WHMIS.

Prerequisite: Biology 61.642/Chemistry 65.578(BIO9101/CHM8156).

Chemistry 65.543 (CHM8112)

#### **Methods of Analytical Chemistry**

This course describes the criteria used in choosing the best analytical technique for specific problems including, accuracy, precision, sensitivity, linearity, detection limits, interferences and the commercial availability of suitable instrumentation for analysis by atomic spectroscopy, electro-chemistry, chromatography, molecular spectrometry and mass spectrometry.

# Ottawa-Carleton Institute for Civil Engineering

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Université d'Ottawa  
University of Ottawa



Carleton University

## The Institute

**Director of the Institute**, N. J. Gardner

**Associate Director of the Institute**, D.T. Lau

Established in 1984, the Institute combines the research strengths and resources of the Departments of Civil and Environmental Engineering at Carleton University and the Department of Civil Engineering at the University of Ottawa. Programs leading to master's and Ph.D. degrees are available through the Institute in a wide range of fields of civil engineering. Programs in transportation engineering, and in water resources engineering are centred at Carleton University and the University of Ottawa, respectively. Programs in environmental, geotechnical, and structural engineering are available at both universities. Graduate students may pursue their research on either university campus, depending upon the choice of program and supervisor. Registration will be at the university to which the student's supervisor is affiliated. Requests for admission may be sent to the Director of the Institute. Graduate studies in Environmental Engineering are also available through the Ottawa-Carleton Institute for Environmental Engineering which offers graduate degrees in Environmental Engineering.

## Members of the Institute

The "home" department of each member is indicated by (C) for the Department of Civil and Environmental Engineering at Carleton University and (O) for the Department of Civil Engineering at the University of Ottawa.

• A.O. Abd El Halim, *Transportation, Pavements and Materials, Geometric Design* (C)

• Kazimierz Adamowski, *Hydrology, Stochastic and Statistical Analyses* (O)

• John Adjeleian, *Structures, Building Design & Construction* (C - Professor Emeritus)

• M.O. Al-Hunaidi, *Soil Dynamics, Soil Structure Interaction, Non Destructive Testing* (O - Adjunct)

• A. Baskaran, *Building Science, Computational Fluid Dynamics* (O - Adjunct)

• G.E. Bauer, *Geotechnical Engineering, Soil Improvement, Earth Retaining Structures, In-Situ Testing* (C - Adjunct)

• J.J. Beaudoin, *Cement Chemistry, Strength of Composite Materials* (O - Adjunct)

• D.W.R. Bell, *Transportation, Engineering Economics and Policy, Airport Planning* (C - Adjunct)

• J.P. Braaksma, *Transportation, Airport Planning, Traffic Engineering, Pedestrian Circulation, Terminal Design* (C)

• M. Bruneau, *Steel Structures, Earthquake Engineering, Computer-Aided Design* (O-Adjunct)

• Pascale Champagne, *Environmental Engineering, Passive Treatment Systems, Acid Mine Drainage (AMD) Mitigation* (C)

• M.S. Cheung, *Finite Element Analysis, Bridge Engineering* (C/O - Adjunct)

• S.E. Chidiac, *Heritage Structures, Durability, Mathematical Modelling* (C - Adjunct)

• R.L. Droste, *Environmental Engineering, Water and Wastewater Treatment* (O)

• S.M. Easa, *Highway Geometry, Reliability Concept, Planning* (C - Adjunct)

• Erman Evgin, *Finite Elements, Soil Plasticity, Environmental Geomechanics* (O)

• G.Y. Felio, *Performance and Rehabilitation of Urban Infrastructure, Water Distribution System* (C - Adjunct)

• Leta Fernandes, *Environmental Engineering, Agricultural Waste Management* (O)

• S. Fou, *Seismic Risk Assessment and Management* (O - Adjunct)

• R. Frenette, *Water Resources* (O)

• N.J. Gardner, *Structures, Reinforced Concrete, Earthquake Engineering, Construction Loads* (O)

• V.K. Garga, *Geotechnical Engineering, Dams, Harbours, Heavy Foundations* (O)

• G.A. Hartley, *Structural Analysis, Finite Elements, Boundary Elements* (C)

• N.M. Holtz, *Computer-Aided Structural Engineering* (C)

• J.L. Humar, *Structures, Earthquake Engineering, Computer-Aided Design* (C)

• Khaled Ibrahim, *Structural Engineering, Masonry Structures* (C - Adjunct)

• W.F. Johnson, *Urban Transportation Planning and Management* (C - Adjunct)

• Deniz Karman, *Environmental Engineering, Motor Vehicle Emissions and Urban Air Quality* (C)

- K.J. Kennedy, *Environmental Engineering, Waste Water Treatment* (O)
- S.J. Kennedy, *Steel Structures, Composite Structures, Material Behaviour, Experimental Methods, Computer-Aided Structural Engineering* (C)
- A.M. Khan, *Transportation, Systems Planning, Engineering and Management* (C)
- D.T. Lau, *Earthquake Engineering, Experimental and Numerical Methods for Modelling of Structures, Performance Assessment and Field Monitoring of Bridges, Liquid Storage Tank Design* (C)
- K.T. Law, *Geotechnical Engineering, Embankments, In-Situ Testing* (C)
- J.R. Mehaffey, *Fire Protection Engineering* (C - Adjunct)
- E.H.H. Mohamed, *Transportation Engineering, Pavement and Materials* (C - Adjunct)
- M.E. Mohareb, *Structural Engineering* (O)
- R.M. Narbaitz, *Solid Waste Management, Ground Water Contamination* (O)
- Nove Naumoski, *Earthquake Engineering* (O - Adjunct)
- S. S. F. Ng, *Structures, Numerical Methods, Dynamic Behaviour* (O - Professor Emeritus)
- W.J. Parker, *Environmental Engineering, Waste Water Treatment, Fate of Contaminants in Engineered and Natural Systems, Biological Processes*. (C)
- G.G. Patry, *Wastewater Treatment Process Simulation and Control* (O)
- B.N. Persaud, *Transportation, Traffic Engineering, Highway Safety* (C - Adjunct)
- A.G. Razaqpur, *Concrete, Finite Elements, Fibre Reinforced Polymers, Bridges* (C)
- Murat Saatcioglu, *Building Structures, Reinforced Concrete, Earthquake Analysis and Design* (O)
- J.J. Salinas, *Building Structures, Wood Engineering, Structural Reliability* (C)
- E.J. Schiller, *Environmental Engineering, Water Supply and Irrigation* (O)
- A.P.S. Selvadurai, *Geotechnical Engineering, Continuum Mechanics, Applied Mathematics* (C - Adjunct)
- L.A.Y. Shallal, *Transportation, Planning and Management, Traffic Engineering* (C - Adjunct)
- T.S. Sridhar, *Environmental Impact Assessment, Wastewater Treatment, Hazardous and Radioactive Waste, Pollution Control* (C)
- G.T. Suter, *Structural Engineering, Masonry Structures* (C-Adjunct)

- O.J. Svec, *Geomechanics, Pavement Materials, Numerical Methods* (C - Adjunct)
- Hiroshi Tanaka, *Structures, Wind Engineering* (O)
- D.R. Townsend, *Water Resource Engineering, Applied Hydraulics, River Engineering* (O)
- S.K. Vanapailli, *Design and Construction of Waste Management Structures and Critical State Soil Mechanics* (O-Adjunct)
- M.A. Warith, *Environmental Engineering* (C/O - Adjunct)
- Paul Van Geel, *Environmental Engineering, Groundwater Flow and Contaminant Transport, Waste Disposal* (C)
- E.W. Wright, *Structures, Computer-Aided Design* (C - Adjunct)

## Master's Degree

### Admission Requirements

1. Graduates from engineering or Honours science programs with a mathematics content equivalent to the civil engineering program will have to take a minimum of four qualifying undergraduate civil engineering courses in their area of graduate specialty

2. Graduates from other science programs will have to take all the core engineering undergraduate mathematics courses in addition to the requirements specified in (1) above.

The undergraduate courses required will be specified in the Certificate of Admission.

Undergraduate civil engineering courses will not be accepted towards a graduate degree. Graduate students may still be required to take undergraduate courses for credit to fulfil the admission requirements.

No more than one half of the program credit requirements or that stipulated in the regulations of the university in which the student is registered, whichever is less, can be transferred at admission. At least one half of the course work must be taken at the Institute.

### Program Requirements

The requirements for course work are specified in terms of credits: one credit is one hour of instruction per week for one term. The requirements for the master's degree by thesis are:

- \* Eighteen course credits
- \* Thesis equivalent to eighteen course credits
- \* Participation in the civil engineering seminar series
- \* Successful oral defence of the thesis

The requirements for the master's degree by course work are:

- \* Twenty-seven course credits
- \* A project equivalent to nine course credits

## Doctor of Philosophy

### Admission Requirements

The normal requirement for admission into the Ph.D. program is a master's degree with thesis in civil engineering.

### Program Requirements

The requirements for course work are specified in terms of credits: one credit = one hour/week for one term.

- \* A minimum of fifteen course credits
- \* Participation in the civil engineering seminar series
- \* Successful completion of written and oral comprehensive examinations in subject areas determined by the student's advisory committee
- \* Successful completion of a thesis proposal examination
- \* Thesis
  - \* Successful oral defence of the thesis. The examination board for all theses will include an external examiner, and, when possible, professors from both departments.
  - \* Subject to approval of his/her advisory committee, a Ph.D. student may take, or be required to take, courses in other disciplines.

Students who have been permitted to transfer into the Ph.D. program from a master's program without having completed the master's degree, will require thirty course credits for the Ph.D. degree which include transfer of credits from the incompleting master's program.

### Graduate Courses

In all programs, the student may choose graduate courses from either university with the approval of the adviser or the advisory committee. Graduate courses are listed below, grouped by subject area. Course descriptions may be found in the departmental section of the calendar concerned. All courses are of one term duration. The codes given in parenthesis are those used by the University of Ottawa. Courses beginning with "82" are offered at Carleton University and those beginning with "83" are offered at the University of Ottawa. Not all courses listed are necessarily given during one academic year.

#### *Geotechnical and Soils*

- 82.529 (CVG7100)
- 82.530 (CVG7101)
- 82.550 (CVG7104)
- 82.551 (CVG7105)
- 82.552 (CVG7106)
- 82.553 (CVG7107)
- 82.554 (CVG7108)
- 82.580 (CVG7309), 82.584 (CVG7305)
- (CVG5100) 83.500 Deep Foundations
- (CVG5103) 83.503 Dam Engineering
- (CVG5106) 83.506 Site Improvements
- (CVG5108) 83.508 Pile Dynamics
- (CVG5171) 83.512 Strength and Deformation Behaviour of Soil and Rock
- (CVG5174) 83.514 Soil Plasticity
- (CVG5177) 83.517 Offshore Geotechnique
- (CVG5178) 83.518 Ice Mechanics

#### *Structural Engineering*

- 82.511 (CVG7120)
- 82.512 (CVG7121)
- 82.513 (CVG7122)
- 82.514 (CVG7123)
- 82.515 (CVG7124)
- 82.516 (CVG7137)
- 82.520 (CVG7138)
- 82.523 (CVG7125)
- 82.524 (CVG7126)
- 82.525 (CVG7127)
- 82.526 (CVG7128)
- 82.528 (CVG7130)
- 82.560 (CVG7131)
- 82.561 (CVG7140)
- 82.562 (CVG7141)
- 82.565 (CVG7143)
- 82.566 (CVG7144)
- 82.567 (CVG7145)
- 82.568 (CVG7146)
- 82.575 (CVG7304), 82.579 (CVG7300)
- (CVG5142) 83.521 Advanced Structural Dynamics
- (CVG5143) 83.522 Advanced Structural Steel Design

- (CVG5144) 83.530 Advanced Reinforced Concrete Design
- (CVG5145) 83.523 Theory of Elasticity
- (CVG5146) 83.532 Numerical Methods of Structural Analysis  
(CVG5147) 83.524 Theory of Plates and Shells
- (CVG5148) 83.535 Prestressed Concrete Design
- (CVG5150) 83.526 Advanced Concrete Technology
- (CVG5153) 83.529 Wind Engineering
- (CVG5155) 83.536 Earthquake Engineering
- (CVG5156) 83.531 Finite Element Methods I
- (CVG5157) 83.533 Finite Element Methods II
- (CVG5158) 83.537 Elements of Bridge Engineering
- (CVG5154) 83.538 Random Vibrations
- (CVG5159) 83.539 Long Span Structures
- Transportation*  
82.533 (CVG7103)
- 82.534 (CVG7150)
- 82.535 (CVG7151)
- 82.536 (CVG7152)
- 82.537 (CVG7153)
- 82.538 (CVT7154)
- 82.539 (CVG7155)
- 82.541 (CVG7156)
- 82.542 (CVG7159)
- 82.543 (CVG7158)
- 82.585(CVG7310) - 82.589(CVG7314)
- Water Resources*  
(CVG5111) 83.551 Hydraulic Structures
- (CVG5119) 83.583 Computational Hydraulics
- (CVG5120) 83.556 Water Resources Systems
- (CVG5122) 83.558 Groundwater and Seepage
- (CVG5123) 83.559 Advanced Topics in Hydrology
- (CVG5125) 83.561 Statistical Methods in Hydrology
- (CVG5126) 83.562 Stochastic Hydrology
- (CVG5127) 83.563 Hydrologic Systems Analysis
- (CVG5128) 83.564 Water Resources Planning and Policy
- (CVG5131) 83.566 River Engineering
- (CVG5135) 83.568 Water Supply and Sanitation in Developing Countries
- (CVG5140) 83.567 Irrigation and Drainage
- Environmental*  
81.501
- 81.511
- 81.512 (CVG7161)
- 81.513 (CVG7162)
- 81.514
- 81.521
- 81.522
- 81.523 (CVG7164)
- 81.531
- 81.532 (CVG7163)
- 81.533
- 81.541
- 81.542
- (CVG 5130) Wastewater Treatment: Process Design
- (CVG 5132) Unit Operations of Water Treatment
- (CVG 5136) Water and Wastewater Treatment Laboratories
- (CVG 5137) Water and Wastewater Treatment Process Analysis
- (CVG 5133) Solid Waste Disposal
- (CVG 5134) Aquatic Chemistry for Environmental Engineers
- (CVG 5179) Anaerobic Digestion
- (CVG 5180) Biological Nutrient Removal
- (CVG 6315) Sludge Processing, Utilization, and Disposal
- Directed Studies*  
82.596 and 82.597
- 83.570 (CVG6108) and 83.571 (CVG6109) Individual Directed Studies
- 83.600 (CVG6399) - 83.603 (CVG6300) Advanced Topics
- Projects and Theses*  
82.590
- 82.599
- 82.699
- CVG6000 Civil Engineering Report/ Rapport en génie civil
- CVG7999 M.A.Sc.Thesis/Thèse
- Comprehensive Examination*  
CVG9998 (Ph.D.) Examen de synthèse

# Civil and Environmental Engineering

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## The Department

**Chair of the Department, W.J. Parker**

**Departmental Supervisor of Graduate Studies, D.T. Lau**

**In addition to University and Graduate Faculty regulations, all Engineering departments share common procedures that are described in Section 18 of the General Regulations (see p.69)**

The Department of Civil and Environmental Engineering offers programs of study and research leading to the Master of Engineering and Ph.D. degrees in Civil Engineering and Environmental Engineering. Civil Engineering degrees are offered through the Ottawa-Carleton Institute for Civil Engineering, which is jointly administered by the Department of Civil and Environmental Engineering at Carleton University and the Department of Civil Engineering at the University of Ottawa. For further information, including admission and program requirements, see p. 116. Environmental Engineering degrees are administered by the Department of Civil and Environmental Engineering. See p. 177 for degree information.

The Department conducts research and has developed graduate programs in the following areas:

### \* *Environmental Engineering*

The program in environmental engineering offers opportunities for research in a wide range of topics. Current graduate research in environmental engineering is primarily directed towards the following areas:

#### *Air Pollution*

Air quality issues in microenvironments, emissions from mobile sources, receptor modelling, transport and fate of vapours and particulates, dispersion modelling, indoor air quality, innovative treatment technologies for contaminated air streams.

#### *Environmental Impact Assessment*

Environmental impact assessment, risk assessment, identification and quantification of contaminant exposure pathways, uncertainty related to these processes, technical issues and the important contributions of environmental engineers to this complex multi-disciplinary process.

### *Solid, Hazardous, and Radioactive Waste Management and Pollution Prevention*

Reduction of waste streams through improved manufacturing processes and waste diversion programs, minimization of the impact of long-term disposal of solid hazardous and radioactive wastes, waste disposal alternatives, landfill design and landfill leachate and gas management strategies.

### *Water and Wastewater Treatment*

Study of innovative treatment technologies for water and wastewater treatment, fate of VOCs in municipal and industrial waste streams, treatment of effluents from various industries, passive treatment systems for mitigation of acid mine drainage, enhanced UV oxidation processes.

### *Water Resources Management, Groundwater and Contaminant Transport*

Quantification and protection of existing water resources, hydrogeology, processes impacting contaminant migration, natural attenuation of groundwater impacted by landfill leachate, petroleum hydrocarbons and chlorinated solvents, unsaturated and multiphase environments, site characterization and remediation.

The program is intended to be complementary to that at the University of Ottawa, and courses can be selected from either department.

### \* *Geotechnical Engineering*

The graduate program in geotechnical engineering places an emphasis on both theoretical and applied problems related to soil and rock mechanics and foundation engineering. These generally include the study of mechanical properties of soil and rock materials, stability of natural slopes and earth embankments, soil-foundation-structure interaction, and problems in foundation design and geomechanics. Broader programs in geotechnical engineering may be arranged by making use of courses offered in the Department of Geography at Carleton University and in the Department of Civil Engineering at the University of Ottawa.

Graduate research in geotechnical engineering is primarily directed towards the following areas:

#### *Bearing Capacity and Settlement*

Problems related to design of bridge abutments and footings located on sloped granular fill, experimental and field studies.

#### *Design and Analysis of Pipelines in Permafrost Regions*

Development and use of advanced finite element techniques in the study of frost-heave and its effect on the stresses and deformations of chilled gas pipelines buried in discontinuous permafrost.

#### *Earth Retaining Structures*

Experimental and analytical studies of anchored and braced excavations, flexible and rigid retaining walls, soil reinforcement, tunnels and conduits, field behaviour.

#### *In-Situ Testing of Soils*

The use of devices such as the pressuremeter, the screw plate test, the borehole shear device, and borehole dilatometer in the assessment of geotechnical properties of soils.

#### *Mechanical Behaviour*

Development of constitutive relations for soils and rock masses with yield and creep characteristics; applications to foundation engineering.

#### *Performance of Anchors*

Theoretical and experimental analysis of deep and shallow anchors in soil, rock and concrete; group action; creep effects; prestress loss.

#### *Reinforced Soil Systems*

Characterization of the material properties and reinforcement-soil interaction problems comprising geogrids and geotextiles. Extensive facilities for tension, creep, pull-out and interface shear testing of geosynthetics are available.

#### *Soil-Foundation Interaction*

Elastic and consolidation effects of soil-foundation interaction; soil-frame interaction; contact stress measurement; performance of rigid and flexible foundations; buried pipelines.

#### **\* Structural Engineering**

The graduate program in structural engineering embodies a broad spectrum of topics involving material behaviour, structural mechanics and analysis, and the behaviour and design of buildings, bridges, and other types of structures, including liquid storage tanks, dams, and buried pipe systems, etc. These topics are in the following fields: computer applications in structural analysis; structural dynamics, seismic analysis, earthquake engineering; finite element analysis; structural systems and design optimization; behaviour and design of steel, concrete, composite, timber and masonry structures; construction economics; and bridge engineering. Graduate research in structural engineering is primarily directed towards the following areas:

*Behaviour and Design of Steel, Concrete and*

#### *Composite Structures*

Analytical and experimental studies of structural members, substructures, and connections for buildings, bridges, and offshore structures. Development of the corresponding limit states design format design rules.

#### *Computer Applications in Structural Design*

Development of knowledge-based systems for the analysis, design, detailing, fabrication, and erection of buildings and bridges. Includes graphic interfaces, pre- and post-processing of frame analysis, load determination, and finite element analysis packages.

#### *Fibre Reinforced Polymers (FRP)*

Analysis and laboratory testing of structural members and systems reinforced, retrofitted or repaired with FRP. Development of design rules and code provisions for FRP reinforced/repaired structures. The research encompasses all aspects of FRP applications in structures, including bridges, buildings, pipes and tanks. Advanced numerical modelling and large scale testing are integral components of the research program.

#### *Masonry Behaviour and Design*

Study of strength and serviceability issues by means of theoretical approaches, testing, and fieldwork.

#### *Materials Durability*

Research on the durability of concrete, masonry, FRP and reinforcing steel. Both laboratory experimentation and numerical techniques are used to develop predictive models for practical applications.

#### *Monitoring and Evaluation of Structures*

Behaviour and performance of bridges, buildings, and other structures; field and laboratory monitoring techniques; instrumentation; data processing and interpretation.

#### *Numerical Modelling of Buildings and Bridges*

Advanced analytical modelling of reinforced and prestressed concrete, steel, and composite concrete-steel buildings and bridges. Material and geometric non-linearities, bond-slip, the advent and propagation of cracks, tension-stiffening, and shear-connectors behaviour are modelled to predict the full response of structures up to failure.

#### *Seismic Analysis and Design*

Seismic response of buildings; computer analyses of linear and non-linear structural response; design of buildings for seismic forces; development of code provisions for seismic design;

seismic behaviour of liquid storage tanks and dams; fluid structures interaction problems.

#### *Timber Structures*

Analysis, design, and performance evaluation of wood-structured systems and components; structural reliability.

#### **\* Transportation Planning and Technology**

The graduate program in transportation planning and technology deals with problems of policy, planning, economics, design, and operations in all modes of transportation. In the area of transportation planning, the focus is on the design of transport systems, including terminals, modelling and simulation, urban and regional studies, traffic engineering and geometric design. In the transportation technology area, programs deal with technology of vehicles and facilities, acoustics and noise, materials and pavement design. Graduate research in transportation is currently focused on the following areas:

##### *Asphalt Concrete*

Research on asphalt concrete, including compaction, rutting, thermal stresses, stripping, and reinforced asphalt systems. Novel compaction techniques and equipment, and in-situ asphalt testing equipment have been developed and patented.

##### *Planning and Design Methodology*

Development and application of models for optimization of transport supply; transportation system management.

##### *Transport Policy*

Assessment and impact analysis of national, regional, and urban transportation policies.

##### *Transportation Terminals*

Airport planning, air terminal design; bus, rail, subway terminal design, layout methods, pedestrian traffic.

##### *Transportation Technology Development and Assessment*

Modernization of passenger and freight rail services; soil properties; pavement design, multi-layered systems, low temperature cracking of pavements, thermo-mechanical modelling of fracture processes in pavements; highway design, energy and emissions.

##### *Travel and Traffic Analysis*

Behavioural theories of passenger travel, goods movement; empirical traffic studies.

#### **Departmental Facilities**

The structures laboratory facility includes an 11 m x 27 m strong floor with a clear height of 11

m; a strong pit, measuring 3 m x 3.7 m x 6.6 m for geotechnical and highway material testing; a 400,000 lb. universal testing machine with auxiliary equipment for load and displacement control; numerous hydraulic actuators; test frames; specialized equipment for torsion and impact studies; and a wide selection of measurement devices (strain gauges, LVDTs, pressure transducers, load cells, thermocouples) and several data acquisition systems for testing structural materials and components. The concrete laboratory has facilities for the casting, curing, and testing of reinforced concrete members. Laboratory facilities in geotechnical engineering include both large scale and conventional tri-axial testing, consolidation testing, pore water pressure measurements, and model studies of contact stress measurements. The soil dynamics and highway materials laboratories provide facilities for studies of the physical properties of soil, stabilized soil, aggregate and bituminous mixtures, reinforced soil systems and geosynthetics.

The environmental engineering laboratories comprise a total space of 170 square meters with excellent facilities for bench scale chemical and biochemical experiments. Analytical equipment and sensors are available for air, water and soil sample testing and analyses. A laboratory specially equipped with four fume hoods is available for conducting research involving volatile and hazardous substances.

Computer-related equipment with the department comprises networks of SUN workstations and PC-based workstations and related peripherals. The computing centre of the University provides access to additional computing resources such as mainframe computers and multi-processor SUN workstations. A library of computer programs in structural, geotechnical, and transportation engineering provides a significant resource for advanced study and research.

#### **Graduate Courses**

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

All courses listed are one-term courses and may be offered in either fall or winter with the exception of projects and theses.

##### **Civil Engineering Courses**

Engineering 82.511 (CVG7120)

##### **Introductory Elasticity**

Stresses and strains in a continuum; transformations, invariants; equations of motion; constitutive relations, generalized Hooke's Law, bounds for elastic constant: strain energy,

superposition, uniqueness; formulation of plane stress and plane strain problems in rectangular Cartesian and curvilinear coordinates, Airy-Mitchell stress functions and Fourier solutions.

Engineering 82.512 (CVG7121)

#### **Advanced Elasticity**

Continuation of topics introduced in Engineering 82.511. Complex variable solutions: torsional and thermal stresses; axially symmetric three-dimensional problems, Love's strain potential, Boussinesq-Galerkin stress functions; problems related to infinite and semi-infinite domains. Introduction to numerical methods of stress analysis, comparison of solutions. Prerequisite: Engineering 82.511 or permission of the Department.

Engineering 82.513 (CVG7122)

#### **Finite Element Methods in Stress Analysis**

Stress-strain and strain-displacement relationships from elasticity. Plane stress and plane strain finite elements. Lagrange interpolation and Lagrange based element families. Theory of thin plates; overview of plate bending elements. Theory of shells; practical shell elements. Finite element methods formulation. Also offered at the undergraduate level, with different requirements, as Engineering 82.421 ★, for which additional credit is precluded.

Engineering 82.514 (CVG7123)

#### **Earthquake Engineering and Analysis**

Advanced vibration analysis techniques; Rayleigh-Ritz procedure; subspace iteration; derived Ritz coordinates; proportional and non-proportional damping; introduction to seismology; earthquake response analysis via time and frequency domain; response spectrum approach; multiple input excitations; design considerations and code requirements; other advanced topics in earthquake engineering. Prerequisite: Engineering 82.516 or permission of the Department.

Engineering 82.515 (CVG7124)

#### **Advanced Finite Element Analysis in Structural Mechanics**

Variational and Galerkin formulations: assumed displacement, assumed stress and hybrid elements; plate bending: convergence, completeness and conformity, patch test, Kirchhoff and Mindlin plate theories, nonlinear elasticity and plasticity; geometric non-linearity, Eulerian and Lagrangian formulations; incremental and iterative schemes, finite elements in dynamics. Prerequisite: Engineering 82.513 or permission of the Department.

Engineering 82.516 (CVG7137)

#### **Dynamics of Structures**

Structural dynamics, single and multi-degree-of-freedom systems, formulation of equations of motion, methods of analytical mechanics, free and forced vibrations, normal mode analysis, numerical methods for the response analysis

of single and multiple-degree-of-freedom systems.

Engineering 82.520 (CVG7138)

#### **Engineered Masonry Behaviour and Design**

Properties of masonry materials and assemblages. Behaviour and design of walls, columns and lintels. Treatment of specialized design and construction topics. Design of lowrise and highrise structures. Discussion of masonry problems. Emphasis throughout the course is placed on a practice-oriented approach. Also offered at the undergraduate level, with different requirements, as Engineering 82.443 ★, for which additional credit is precluded.

Engineering 82.523 (CVG7125)

#### **Theory of Structural Stability**

Elastic and inelastic behaviour of beam-columns; elastic and inelastic buckling of frames; application of energy methods to buckling problems; lateral-torsional buckling of columns and beams; buckling of plates; local buckling of columns and beams.

Prerequisite: Engineering 82.525 or equivalent.

Engineering 82.524 (CVG7126)

#### **Behaviour and Design of Steel Structures**

Limit states design philosophy; material behaviour; tension members; plate buckling; torsion; lateral torsional buckling; beams, axially loaded columns and beam-column behaviour; brittle fracture and fatigue; frame stability and second order effects.

Engineering 82.525 (CVG7127)

#### **Advanced Modelling and Analysis of Structures**

Matrix structural analysis; force and displacement method of analysis for planar and space structures; symmetric and anti-symmetric structures; analysis of nonlinear structures: geometric and material nonlinearities; large displacement theory and iteration strategy.

Engineering 82.526 (CVG7128)

#### **Prestressed Concrete**

Prestressed concrete materials; working stress design for flexure; ultimate strength design for flexure, shear, and torsion; prestress losses; deflection and camber; slabs; indeterminate beams and frames; introduction to prestressed bridges and circular tanks.

Engineering 82.528 (CVG7130)

#### **Advanced Reinforced Concrete**

The research background, development, and limitations in current building code provisions for reinforced concrete; yield line theory of slabs; safety and limit state design; computer design of concrete structures.

Engineering 82.529 (CVG7100)

#### **Case Studies in Geotechnical Engineering**

The critical study of case histories relating to current procedures of design and construction in geotechnical engineering. The importance

of instrumentation and monitoring field behaviour will be stressed. In-situ testing.

Engineering 82.530 (CVG7101)

**Advanced Soil Mechanics**

Effective stress, pore pressure parameters, saturated and partially saturated soils; seepage; permeability tensor, solutions of the Laplace equation; elastic equilibrium; anisotropy, non-homogeneity, consolidation theories; shear strength of cohesive and cohesionless soils; failure and yield criteria.

Engineering 82.533 (CVG7160)

**Pavements and Materials**

An analysis of the interaction of materials, traffic, and climate in the planning, design construction, evaluation, maintenance, and rehabilitation of highway and airport pavements.

Engineering 82.534 (CVG7150)

**Intercity Transportation, Planning and Management**

Current modal and intermodal issues, including energy. Framework and process of intercity transport planning and management. Recent trends and system development. Passenger and freight demand and service characteristics. Future prospects and possibilities.

Engineering 82.535 (CVG7151)

**Traffic Engineering**

Introduction to principles of traffic engineering. Basic characteristics of drivers, vehicles, and traffic. Volume, speed, and delay studies. Traffic stream characteristics and queuing theory. Capacity analysis of roads and intersections. Safety.

Engineering 82.536 (CVG7152)

**Highway Materials**

Materials characterization and strength evaluation of soils, stabilized soils, aggregates, and asphalt concrete. Effects of low temperatures and frost on materials behaviour.

Engineering 82.537 (CVG7153)

**Urban Transportation, Planning and Management**

Urban transportation systems, planning and management. Urban development models, an introduction. Urban transportation policy.

Engineering 82.538 (CVG7154)

**Geometric Design**

Basic highway geometric design concepts. Vertical and horizontal alignment. Cross-sections. Interchange forms and design. Adaptability and spacing of interchanges. Design of operational flexibility; operational uniformity, and route continuity on freeways.

Engineering 82.539 (CVG7155)

**Transportation Supply**

Advanced treatment of transportation planning and management concepts and techniques: transport supply issues, capacity and costs,

evaluation of system improvements and extensions, transportation and development, policy impact analysis.

Engineering 82.541 (CVG7156)

**Transportation Economics and Policy**

Transportation, economic analysis framework. Transport industry output. Carrier operations. Issue of resource utilization, measurement, economics, supply of infrastructure, pricing; subsidies, externalities. Transport policy in Canada.

Engineering 82.542 (CVG7159)

**Transportation Terminals**

Framework for passenger terminal planning and design. Theory: the transfer function and network modelling; pedestrian flow characteristics; capacity of corridors, stairs, escalators, and elevators; layout planning. Practical applications: air, rail, metro, bus, ferry, and multimodal terminals.

Engineering 82.543 (CVG7158)

**Airport Planning**

Framework for airport planning and design. Aircraft characteristics; demand forecasting; airport site selection; noise, airside capacity; geometric design; the passenger terminal complex; cargo area; general aviation; ground transportation; land use planning.

Engineering 82.550 (CVG7104)

**Earth Retaining Structures**

Approaches to the theoretical and semi-empirical analysis of earth retaining structures. Review of the earth pressure theories. Analysis and design methods for rigid and flexible retaining walls, braced excavations, and tunnels. Instrumentation and performance studies.

Engineering 82.551 (CVG7105)

**Foundation Engineering**

Review of methods of estimating compression and shear strength of soils. Bearing capacity of shallow and deep foundations. Foundations in slopes. Pile groups. Use of in-situ testing for design purposes.

Engineering 82.552 (CVG7106)

**In-Situ Methods in Geomechanics**

Subsurface exploration program. Soil and rock sampling. Geo-physical methods. Mechanical and hydraulic properties of soil and rock. Determination of strength and deformability. Critical evaluation of vane, pressuremeter, screw plate, dilatometer, borehole shear and plate load tests. Pumping, recharge and packer tests. In-situ stress measurements.

Engineering 82.553 (CVG7107)

**Numerical Methods in Geomechanics**

Advanced theories of soil and rock behaviour. Plasticity models. Generalized failure criteria. Critical state and cap models. Dilatancy effects. Associative and non-associative flow rules. Hardening rules. Consolidation, visco-

elasticity, creep behaviour. Finite element formulation. Iterative schemes. Time marching schemes. Solution of typical boundary value problems.

Prerequisite: Engineering 82.511, 82.513, or permission of the Department.

Engineering 82.554 (CVG7108)

#### **Seepage and Waterflow through Soils**

Surface-subsurface water relations. Steady flow. Flownet techniques. Numerical techniques. Seepage analogy models. Anisotropic and layered soils. Water retaining structures. Safety against erosion and piping. Filter design. Steady and non-steady flow towards wells. Multiple well systems. Subsidence due to ground water pumping.

Engineering 82.560 (CVG7131)

#### **Project Management**

Managing building development, design, and construction including interrelationships among owners, developers, financing sources, designers, contractors, and users; project manager role and tasks; project objectives; feasibility analyses; budgets and financing; government regulations; environmental and social constraints; cost, time, and content quality controls and processes; human factors.

Engineering 82.561 (CVG7140)

#### **Statistics, Probabilities and Decision-Making Applications in Civil Engineering**

Review of basic concepts in statistics and probabilities. Bayes' Theorem. Distributions. Parameter estimation. Goodness-of-fit. Regression and correlation. OC curves. Monte Carlo simulation. ANOVA. Probability-based design criteria. System reliability. Selected applications in structures, transportation and geomechanics. Use of computer software. Emphasis on problem solving.

Engineering 82.562 (CVG7141)

#### **Advanced Methods in Computer-Aided Design**

Representation and processing of design constraints (such as building codes and other design rules); decision tables; constraint satisfaction. Automatic integrity and consistency maintenance of design databases; integrated CAD systems. Introduction to geometric modelling. Introduction to artificial intelligence. Also offered at the undergraduate level, with different requirements, as Engineering 82.450★, for which additional credit is precluded.

Engineering 82.565 (CVG7143)

#### **Design of Steel Bridges**

Basic features of steel bridges, design of slab-on-girder, box girder and truss bridges. Composite and non-composite design. Introduction to long span suspension and cable-stayed bridges. Discussion of relevant codes and specifications.

Engineering 82.566 (CVG7144)

#### **Design of Concrete Bridges**

Concrete and reinforcing steel properties, basic features of concrete bridges, design of superstructure in reinforced concrete slab, slab-on-girder and box girder bridges, an introduction to prestressed concrete bridges, design of bridge piers and abutments. In all cases the relevant provisions of Canadian bridge codes are discussed.

Engineering 82.567 (CVG7145)

#### **Introduction to Bridge Design**

Limit states design of highway bridges; methods of analysis, design and evaluation procedures of superstructure components; design codes; design loads and load factors; concrete deck design; load distributions; computer analysis; impact and dynamics; fatigue and brittle fracture; construction bracing; load capacity rating of existing bridges.

Engineering 82.568 (CVG 7146)

#### **Introduction to Fire Protection Engineering**

Introduction to basic chemistry and physics of fire; fire growth and fire severity in buildings; simple models for the prediction of the course of a building fire; reaction of building components to exposure by fire; design of fire safe buildings.

Engineering 82.575 - 82.579 (CVG7300-7304)

#### **Special Topics in Structural Engineering**

Courses in special topics related to building design and construction, not covered by other graduate courses; details will be available some months prior to registration.

Engineering 82.580 - 82.584 (CVG7305-7309)

#### **Special Topics in Geotechnical Engineering**

Courses in special topics in geotechnical engineering, not covered by other graduate courses; details will be available some months prior to registration.

Engineering 82.580 (CVG7305)

#### **Analysis of Embankments and Slopes**

Stability of embankments of soft clays; stress-strain analysis; anisotropy; strain rate effect; short and long-term settlement; methods of slope stability analysis; progressive failure; use of stability charts; slope analysis for residual and unsaturated soils.

Engineering 82.585 - 82.589 (CVG7310 - 7314)

#### **Special Topics in Transportation Planning and Technology**

Courses in special topics in transportation engineering, not covered by other graduate courses; details will be available some months prior to registration.

Engineering 82.590

**Civil Engineering Project**

Students enrolled in the M.Eng. program by course work will conduct an engineering study, analysis, or design project under the general supervision of a member of the Department.

Engineering 82.596

**Directed Studies**

Engineering 82.597

**Directed Studies**

Engineering 82.599

**M.Eng. Thesis**

Engineering 82.699

**Ph.D. Thesis**

**Environmental Engineering Courses**

Engineering 81.501

**Biofilm Processes**

Physical and chemical properties of biofilms. Microbial ecology of biofilms. Biofilm processes, attachment, growth, sloughing. Transport and interfacial transfer phenomena; mass transfer models, mass transport in biofilms, deposition of solids. Modeling biofilm systems; single and multiple species models, mass balance equations, boundary conditions, moving boundary problem, analytical and numerical solutions. Case studies.

Engineering 81.511

**Air Pollution Control**

Air quality and pollution; definitions, measurement and monitoring methods. Criteria pollutants, air toxics, particulate matter, secondary pollutants. Pollutant formation mechanisms. Major sources and control methods. Meteorology and principles of dispersion modeling. Principles of receptor modeling. Indoor air quality.

Engineering 81.512 (CVG 7161)

**Traffic Related Air Pollution**

Pollutant formation, emission characterization, emission control technology and emission modeling from motor vehicles. Dispersion and receptor modeling for conservative pollutants in urban microenvironments. Personal exposure and health risk assessment.

Engineering 81.513 (CVG 7162)

**Ambient Air Quality and Pollution Modeling**

Dispersion modeling for simple and complex sources and complex terrain. Physical and chemical transformations for pollutants in the atmosphere. Urban and regional air pollution modeling for reactive pollutants. The urban air shed model. Regional air quality modeling case studies.

Engineering 81.514

**Indoor Air Quality**

Indoor air quality as a component of the indoor environment; physical and chemical param-

eters for characterization. Types and sources of indoor air pollution, measurement techniques. Heating, ventilation, and air conditioning practices and issues. The human factor in identifying and controlling indoor air pollution.

Engineering 81.521

**Environmental Geotechnical Engineering**

Landfill design; hydrogeologic principles, water budget, landfill liners, geosynthetics, landfill covers, quality control and quality assurance, clay/leachate interaction, composite liner design and leachate collection systems. Landfill operation, maintenance and monitoring. Case studies of landfill design and performance. Design of environmental control and containment systems; slurry walls, grout curtains.

Engineering 81.522

**Toxics in Environmental Systems**

Mechanisms and chemical properties influencing the fate of toxic contaminants in environmental systems; liquid-gas partitioning and mass transfer, liquid-solid partitioning, abiotic and biotic degradation of toxics. Fate of toxics in wastewater collection and treatment systems. Treatment of residual streams; sludges, air streams. Mechanisms influencing the fate of toxic contaminants in aquatic and subsurface environments.

Engineering 81.523 (CVG 7164)

**Hazardous and Radioactive Waste Management**

Classification of hazardous, radioactive and mixed wastes, hazardous waste treatment processes, wastes generated in the nuclear fuel cycle, radioactive waste classification, radioactive waste treatment and management of residuals, engineered systems for long-term isolation and disposal, mixed waste management.

Engineering 81.531

**Hydrogeology and Groundwater Flow**

Theory of flow through porous media; soil characterization, soil properties, anisotropy, heterogeneity. Contaminant transport. Well hydraulics and pump tests. Introduction to numerical modeling; finite difference, finite elements, conceptual model, boundary conditions. Site remediation and remediation technologies.

Engineering 81.532 (CVG 7163)

**Case Studies in Hydrogeology**

Development of a conceptual model; chemistry, geology and hydrology, site characterization, initial and boundary conditions. Application of industry-recognized computer codes to model flow and contaminant transport at a particular site. Evaluation of remedial alternatives at a site. Modeling of the more common remediation technologies (soil vapour extraction, air sparging, pump and treat, biodegradation).

Engineering 81.533

**Unsaturated and Multiphase Flow**

Theory of unsaturated flow and multiphase flow; capillary pressure-saturation relationships, relative permeability relationships, wettability, hysteresis, fluid entrapment, residual saturations, governing equations for flow and transport. Richard's Equation for unsaturated flow. Modeling of multiphase flow.

Engineering 81.541

**Environmental Impact Assessment of Major Projects**

Regulatory framework and impact assessment requirements for project approvals, survey of the components of the EIA process and methodology, the review process, public participation in environmental decision-making, preparation of the EIA document, case studies of major engineering projects.

Engineering 81.542

**Finite Elements in Field Problems**

Use of the Galerkin and Ritz finite element formulations to solve one and two dimensional field problems related to environmental, civil and mechanical engineering. Steady state and time-dependent phenomena involving heat transfer, fluid flow, diffusion, and dispersion will be treated with an emphasis on practical applications. Requires a basic knowledge of third year-level undergraduate engineering mathematics and physics

Engineering 81.580

**Engineering Seminar**

Engineering 81.590

**Environmental Engineering Project**

Students enrolled in the M.Eng. program by course work will conduct an engineering study, analysis, or design project under the general supervision of a member of the Department.

Engineering 81.596

**Directed Studies**

Engineering 81.597

**Directed Studies**

Engineering 81.599

**M.Eng. Thesis**

Engineering 81.699

**Ph.D. Thesis****Other Courses of Particular Interest***Mechanical and Aerospace Engineering*

88.514, 88.517, 88.521, 88.550, 88.561, 88.562, 88.568

*Systems and Computer Engineering*

94.501

*Geography*

45.417 Geotechnical Mechanics

45.532, 45.533, 45.534

*Public Administration*

50.510, 50.511

# Cognitive Science

Institute of Interdisciplinary Studies  
Duntun Tower 2216  
Telephone: 520-2368  
Fax: 520-3985  
Email: iis@carleton.ca

## The Institute

**Director of the Institute,** Andrew Brook

**Director of the Cognitive Science Doctoral Program,** Andrew Brook

The Institute of Interdisciplinary Studies offers a program of study and research leading to the degree of Doctor of Philosophy in Cognitive Science.

The School of Computer Science and the Departments of Psychology, Linguistics and Applied Language Studies, and Philosophy participate in the doctoral program.

The program offers two fields of study:

- \* language and cognition
- \* representation and learning

The field of language and cognition includes the following sub-fields: linguistic theory, psycholinguistics, linguistic methodology, philosophy of language, the mind's processing of language, acquisition of language and other symbolic systems, memory and language, text analysis, computational linguistics, natural language processing, and alternative architectures.

The field of representation and learning includes the following sub-fields: the mind's cognitive resources and how it uses them, memory, vision, attention, the psychophysics and neural foundations of cognition, philosophical theories of representation, history of cognitive science, evolutionary approaches to cognition, knowledge representation, computer simulations of memory constraints, expert systems, case-based systems, genetic algorithms, heuristic theorems, neural networks, support systems for cognitive processes, and machine learning

## Members of the Cognitive Science Doctoral Program

- Andrew Brook, *Philosophy of Mind and Language, Kant, History of Cognitive Science*
- Murray Clarke, *Philosophy of Mind* (Concordia - Adjunct)
- Jean-Pierre Corriveau, *Natural Language Processing, Time-constrained Memory and Text Comprehension*
- Bruno Emond, *Artificial Intelligence* (University of Quebec at Hull - Adjunct)

- Babak Esfandiari, *Agent-based Systems, Symbolic Machine Learning, Algorithms and Heuristics*
- Helen Goodluck, *Language Acquisition and Processing* (Ottawa - Adjunct)
- Chris Herdman, *Word Recognition, Phonemic and Lexical Processing, Attention and Word Recognition*
- Marie-Odile Junker, *Conceptual Semantics, Semantics of Quantifiers*
- J.B. Kelly, *Sensory Neuroscience and Related Issues in the Biological Foundations of Cognition*
- W.R. Lalonde, *Artificial Intelligence, Connectionism, Cerebral Computation*
- Ann Laubstein, *Speech-production Models, Phonology, Speech Recognition Algorithms*
- Jo-Anne Lefevre, *Numerical and Lexical Cognition*
- John Logan, *Spoken Language Perception, History of Cognitive Science*
- Stephen Marsh, *Distributed Artificial Intelligence* (NRC - Adjunct)
- Stanislas Matwin, *Symbolic Machine Learning* (Ottawa - Adjunct)
- John F. Meech, *Intelligent Agents, User Interface Agents, Adaptive and Intelligent Agents* (NRC - Adjunct)
- Martin Montminy, *Philosophy of Mind, Philosophy of Language* (Ottawa - Adjunct)
- Franz Oppacher, *Genetic Approaches to Cognition, Genetic Algorithms, Natural Language and Knowledge-based Systems, Machine Learning, Computational Linguistics*
- Lise Paquet, *Visual Perception*
- W.M. Petrusic, *Psychophysics of Cognition Science*
- Charles Reiss, *Linguistics* (Concordia - Adjunct)
- Monique Sénéchal, *Vocabulary Acquisition*
- Robert Stainton, *Philosophy of Language and Linguistics, Pragmatics and Semantics*
- Lew Stelmach, *Vision and Attention* (Communication Research Centre) (Adjunct)
- Stanislas Szpakowicz, *Computational Linguistics, Knowledge Acquisition, Decision Support Systems* (Ottawa - Adjunct)
- Andre Vellino, *Artificial Intelligence* (Nortel-Adjunct)
- Robert West, *Cognitive Modeling, Human Computer Interface*
- Helmut Zobl, *Knowledge Representation, Second-language Acquisition and Processing*

## Admission Requirements

The requirements for admission into the Ph.D. program is a master's degree (or the equivalent) from one of the participating disciplines, an Honours degree from a participating discipline, a combined Honours degree (or the equivalent) from two of the participating disciplines or an Honours degree in cognitive science. Students with an Honours bachelor's degree from another discipline with a significant focus on cognition may also apply.

Normally, a substantial proportion of an applicant's work will have been in natural and/or artificial cognition.

Applicants with a master's degree are normally admitted to a 10.0 credit program while applicants with a bachelor's degree are admitted to a 15.0 credit program.

Students who are eligible for admission to the 10.0 credit program but who have deficiencies may be required to take additional courses. In some circumstances, these students will be admitted to the 15.0 credit program.

An average of A- or better in relevant courses is normally required.

Applicants whose first language is not English must demonstrate a fluent knowledge of English. This is normally satisfied by passing a TOEFL test with a score of 580 or better. (See p.55.)

Before admission, a candidate must submit a description of his or her proposed area of thesis research and a member of the core faculty must indicate in writing that he or she is willing to supervise the student.

## Program Requirements

Program requirements for the Ph.D. degree are outlined in the General Regulations section of this Calendar.

All doctoral students must successfully complete:

- \* Cognitive Science 07.680 (1.0 credit)
- \* 2.0 credits in the area of cognition from the course offerings of at least three of the four participating academic units and other than those offered by the cognitive science program.
- \* Cognitive Science 07.690 (1.0 credit)
- \* Cognitive Science 07.695 (1.0 credit)
- \* a second language if required (see below)
- \* a thesis (equivalent to 5.0 credits) which must be defended at an oral examination

In addition, students in the 15.0 credit doctoral program in cognitive science must successfully complete:

\* Cognitive Science 07.501, 07.502, 07.503 and 07.504

\* Psychology 49.520

\* 2.0 credits in the area of cognition at the 500- and 600-level, chosen from the course offerings of at least three of the four participating academic units

To enter the final 10.0 credits of the program, students must complete these courses with B+ or better. Students with a strong background in any of these required areas may apply to be exempted.

Any student planning to complete a dissertation with an applied cognitive emphasis is required to work for at least one term at a facility approved by the student's research supervisor and the Director of the Cognitive Science Program. Such a facility may include any institution, governmental laboratory, corporation, hospital or educational centre that is conducting research in the area of the student's specialization. Students should complete this work while registered in either the Comprehensive Examination (07.695) or the Ph.D. Thesis (07.699).

## Comprehensive Examinations

The comprehensive examination consists of three parts. Each part must be completed in a different participating discipline (Psychology, Computer Science, Linguistics and Applied Language Studies or Philosophy). Under special circumstances another discipline may be substituted.

The purpose of the comprehensive examination is to provide a student with background in a number of approaches to cognition adequate for his or her thesis.

The comprehensive examination is graded as Passed with Distinction/Satisfactory/Unsatisfactory. If any part is graded Unsatisfactory, the student may resubmit the final assignment only one time.

As part of preparation for the comprehensive examination, the student must spend one term in a laboratory or other research venue in each of the three chosen disciplines.

## Thesis

A thesis committee is created prior to completion of the comprehensive examination. The committee is comprised of the thesis supervisor, one faculty member from outside the department, one other member of the core faculty and the director of the program, ex officio.

Normally students will conduct the research for their thesis in the research facilities of their supervisor.

A thesis proposal, prepared in accordance with the guidelines of the thesis supervisor's discipline, must be defended at an oral examination.

The thesis must be defended at an oral examination.

## Residence Requirement

All Ph.D. candidates must be registered full-time in a minimum of six terms to satisfy the residence requirement (nine terms in the case of a 15.0 credit program).

## Language Requirement

A second language is required when relevant to the student's program of research. Whether a second language is required and the level of proficiency expected will be determined at the time of admission based on the student's description of his or her proposed area of thesis research.

## Guidelines for Completion of the Ph.D. Degree

All students must complete Cognitive Science 07.680 and will normally complete the required 2.0 credits within three terms of beginning the final 10.0 credits of the program. Cognitive Science 07.690 must be completed within six terms of beginning the final 10.0 credits of the program.

The first part of the comprehensive examination must be completed by the end of the fourth term after beginning the 10.0 credit program or the final 10.0 credits of the 15.0 credit program. The remaining two parts must be completed within an additional two terms.

Students in the 10.0 credit doctoral program will normally complete the degree in twelve terms of full-time study. Students in the 15.0 credit doctoral program will normally complete the degree in fifteen terms of full-time study.

## Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

## Area Seminars

The purpose of an area seminar is to offer an advanced survey of one of the four participating disciplines.

Cognitive Science 07.501F1,W1,S1

### Cognition and Artificial Cognitive Systems

An introduction to the contribution of artificial intelligence and computer modelling of cognitive processes to cognitive science. (Also listed as Computer science 95.510)

Cognitive Science 07.502F1,W1,S1

### Experimental Research in Cognition

An introduction to the contribution of experimental psychology and neuroscience to cognitive science. (Also listed as Psychology 49.570)

Cognitive Science 07.503F1,W1,S1

### Cognition and Language

An introduction to the contribution of theoretical linguistics and linguistic research to cognitive science. (Also listed as Linguistics and Applied Language Studies 29.561).

Cognitive Science 07.504F1,W1,S1

### Cognition and Conceptual Issues

An introduction to the contribution of philosophy of mind, philosophy of language, and other conceptual investigations to cognitive science. (Also listed as Philosophy 32.520)

## Core Seminars

Cognitive Science 07.680T2

### Proseminar in Cognitive Science

An intensive survey of the central problems and issues of natural and artificial cognition and a brief examination of contemporary neuroscience. Compulsory in the first year of the final 10.0 credits. Students are required to complete the proseminar in the first year of registration.

Cognitive Science 07.690T2

### Research Seminar in Cognitive Science

A full-credit seminar course devoted to the research of students, faculty, and guests of the cognitive science doctoral program. Normally a different researcher will present each week. Compulsory in the second year of the final 10.0 credits. Students in other years are expected to attend on a regular basis.

Cognitive Science 07.691F1,W1,S1

### Directed Studies in Cognitive Science I

Cognitive Science 07.692F1,W1,S1

### Directed Studies in Cognitive Science II

Cognitive Science 07.695F2,W2,S2

### Comprehensive Examination

Cognitive Science 07.699F,W,S

### Ph.D. Thesis

## Selection of Courses in Related Disciplines

Students may register in courses in the area of cognition offered by any of the participating departments, including Computer Science, Psychology, Linguistics, and Philosophy. Students may also register in courses offered by the University of Ottawa, subject to the General Regulations. Please note that not all courses are offered every year and some courses have limited enrolment. Students are advised to consult the Institute for scheduling details.

Courses prefixed by a number are offered at Carleton, by letters at the University of Ottawa.

### *Computer Science*

95.505 (CSI5390), 95.506 (CSI5306), 95.507 (CSI5307), 95.510 (CSI5180), 95.520 (CSI5182) 95.526 (CSI5183), 95.587 (CSI5104), 95.664 (CSI7162), 95.691 (CSI7901)

CSI5101 (95.561) Formal Models of Computational Systems

CSI5162 (95.572) Topics in the Theory of Computing Artificial Intelligence

CSI5181 (95.575) Applications in software Development

CSI5184 (95.584) Logic Programming

CSI5304 (95.562) Knowledge Engineering

CSI5386 (95.555) Natural Language Processing

CSI5387 (95.576) Concept Learning Systems

CSI5388 (95.581) Topics in Machine Learning

CSI5510 (95.577) Formal Principles of Software Development

CSI5580 (95.510) Subject in Artificial Intelligence

### *Psychology (Cognitive Psychology)*

49.516, 49.530, 49.531, 49.543, 49.547, 49.570, 49.573, 49.574, 49.626, 49.661, 49.662, 49.663, 49.665, 49.670

### *(Neuroscience)*

49.520, 49.620, 49.623, 49.624, 49.625, 49.664, 49.666

### *Linguistics and Applied Language Studies*

29.545, 29.561, 29.564, 29.571, 29.592, 29.597

LIN5915 Phonology

LIN5917 Syntax

LIN5918 Semantics

LIN6915 Topics in Phonological Theory

LIN6917 Syntax

LIN7901 Psycholinguistics

LIN7951 Topics in Applied Linguistics.

### *Philosophy*

32.520, 32.514, 32.515, 32.524, 32.525, 32.534, 32.535

# Institute for Comparative Studies in Literature, Art and Culture: Comparative Literary Studies

Dunton Tower 1424  
Telephone: 520-2177  
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E-mail: icslac@carleton.ca

**Director of the Institute:** Christopher Faulkner

**Graduate Supervisor of Comparative Literary Studies:** Francisco Hernández

The Institute for Comparative Studies in Literature, Art, and Culture offers programs of graduate study leading to the degrees of Master of Arts and Doctor of Philosophy in Comparative Literary Studies.

The purpose of the program in comparative literature is to study literature in its international context, and to relate and compare literary phenomena usually studied in isolation because of linguistic barriers and the traditional departmental division of academic disciplines. Thus, taking into account the interrelation of all humanistic studies, such as the various literatures, philosophy, psychology, sociology, the visual arts, and history, comparatists view literary creation within the total complex evolution of world literature. The historical flow of literary archetypes, the role of folklore and myth in literature, recurrent problems of literary theory, and consideration of the less well known literatures of the world are some of the objects of comparative literary studies.

## Qualifying-Year Program

The regulations governing admission to the qualifying-year program are outlined in the General Regulations section of this Calendar.

Applicants will normally have the equivalent of a Combined Honours BA with high honours standing.

The total course program must be determined in consultation with the supervisor of graduate studies. Formal admission to the master's program may be considered at the end of the first term.

## Master of Arts

### Admission Requirements

**Please Note:** Admission to the M.A. program in Comparative Literary Studies had been suspended

The regulations governing admission to the M.A. program are outlined in the General Regulations section of this Calendar (see p.55).

The specific requirements for admission to the M.A. program in Comparative Literary Studies are as follows:

- \* An Honours B.A. degree (or the equivalent) with at least high honours standing in a literature (studied in the original language) or in two literatures or in a literature and a related arts subject

- \* Proficiency in English

- \* An ability to work at the graduate level in an additional language approved by Comparative Literary Studies. Students whose record does not clearly demonstrate this ability will be required to take as part of their program at least 0.5 credit in the literature of this second language in the original language

## Program Requirements

Master's candidates in Comparative Literary Studies will follow one of two 5.0 credit options:

*Thesis Program:*

- \* Comparative Literary Studies 17.501 (0.5 credit), and 17.502 (0.5 credit)

- \* 1.0 credits at the 500-level selected from those courses offered by Comparative Literary Studies (max. 0.5 credit Directed Studies included)

- \* 1.0 credit at the 500-level selected from any course offered in Comparative Literary Studies or from other programs in the University with the approval of the graduate committee.

- \* 17.599 (2.0 credits)

*Non-Thesis Program*

- \* Comparative Literary Studies 17.501 (0.5 credit), and 17.502 (0.5 credit)

- \* 2.0 credits at the 500-level selected from those courses offered by Comparative Literary Studies (max. 0.5 credit Directed Studies included)

- \* 1.0 credit at the 500-level selected from any courses offered in Comparative Literary Studies or from other programs in the University with the approval of the graduate committee

- \* 17.593 (1.0 credit)

## Guidelines for Completion of Master's Degree

The master's program is normally completed no later than two years or six terms after initial

full-time registration and six years or eighteen terms after initial part-time registration.

## Doctor of Philosophy

### Admission Requirements

*Please note: Admission to the Ph.D. program in Comparative Literary Studies has been suspended.*

The normal requirement for admission to the Ph.D. program is an M.A. degree in literary studies (or in related subjects approved by Comparative Literary Studies) with at least high honours standing, normally with no grade below B-.

Each applicant must supply proof, by means of a research effort that has resulted in an extensive essay, that he or she is capable of producing a publishable paper. Such proof will be submitted at the time of application to the program.

Students admitted into the program with a master's degree earned in another department or institution will be required to make up any deficiencies in course work as required by Comparative Literary Studies.

In exceptional cases, an outstanding student who has completed the B.A. Honours degree and who meets the language requirements outlined below, may be admitted directly to the doctoral program. The program requirement for these students is normally 15.0 credits.

A student who transfers from the master's program in Comparative Literary Studies must meet the language requirements on admission as well as those listed under program requirements.

Applicants must demonstrate a capacity to work at the graduate level in at least two languages other than English. The two languages must be approved by Comparative Literary Studies. Normally, one of the two languages must be French. Applicants must also be proficient in English. Students whose native tongue is not English may be required to pass the TOEFL test with a minimum score of 600.

### Program Requirements

\* 3.0 credits at the 600-level to be chosen from courses offered by the discipline. (0.5 credit may be at the 500-level.)

\* 0.5 credit at either the 500- or 600-level in the social sciences to be approved by the graduate adviser.

\* 0.5 credit at the 600-level outside the area of specialization of the student to be chosen from the courses offered by the discipline.

\* A 1.0 credit comprehensive examination, both oral and written parts to be taken prior to the approval of the Ph.D. thesis prospectus.

\* A thesis equivalent to 5.0 credits.

### Comprehensive Examinations

The comprehensive examination is designed to test the candidate's competence both in comparative literary theory and in the chosen area of specialization. The comprehensive examination is to be completed after course requirements for the Ph.D. have been completed.

Students admitted to the program who have a master's degree in the area of literary studies (or in related subjects approved by Comparative Literary Studies) must normally satisfy the comprehensive examination requirement by the end of the third term in the program.

Those students either admitted directly into the program from the B.A. Honours program or transferring from the master's to the doctoral program must satisfy the comprehensive examination requirement no later than the end of the third year or ninth term of study.

Normally the comprehensive examination must be completed no later than four years or twelve terms after the initial part-time registration following the M.A. (or equivalent).

Students admitted directly from the B.A. Honours program or transferring from the master's to the doctoral program must earn 15.0 credits beyond the B.A. honours and most of the master's program in Comparative Literary Studies, with the exception of the comprehensive examination which may be replaced by course work equivalent to 1.0 credit.

### Thesis

The Institute appoints a thesis supervisor and an advisory committee for each doctoral candidate. A minimum of two faculty members will constitute the thesis advisory committee and one of the two members will be from outside Comparative Literary Studies. Both the thesis supervisor and the advisory committee determine when a thesis proposal may proceed to the graduate committee of Comparative Literary Studies for approval.

### Specialization Requirements

Each candidate must demonstrate competence in an area of specialization chosen from the following list: postmodernism, post-colonialism, feminism, gender and literature, the Hebrew Bible, intellectual history, Latin American literature, literary history, literary theory, literature and historical studies, literature and linguistics, literature and religious studies, literature of the Francophonie, literature written in English, language and social sciences, medieval and early

renaissance Hispanic literature, modern theatre and dramatic literature, nineteenth- and twentieth-century French literature, nineteenth- and twentieth-century German literature, nineteenth- and twentieth-century Italian literature.

Candidates who enter the Ph.D. program with a master's degree in a special area or discipline, and who wish to either continue in that area or discipline or choose another specialization in their doctoral program, will be tested in their chosen area in the specialization portion of the comprehensive examination.

Candidates admitted directly from a B.A. Honours program or transferring from the master's to the doctoral program will be required to take the equivalent of 3.0 credits in the area of specialization, and will be tested in this area in the specialization portion of their comprehensive examination.

### Language Requirement

Doctoral students must acquire a reading knowledge in a third language, to be approved by Comparative Literary Studies, before beginning the comprehensive examination. Candidates must successfully complete either 0.5 credit at the master's level in the literature(s) of that language (extra-to-the-degree) or a reading proficiency test administered by Comparative Literary Studies.

### Academic Standing

All candidates are required to maintain a GPA of B-.

Of the 10.0 credits required beyond the master's level, no more than 1.0 credit may be at the 500-level.

### Guidelines for Completion of Doctoral Degree

Students admitted with a B.A. (Honours) degree and registered full-time must normally complete the comprehensive examination requirement by the end of the third year or ninth term of full-time study. The thesis proposal must normally be presented after three and one-half years or ten terms of study.

Students admitted with a master's degree and registered full-time must normally complete the comprehensive examination requirement by the end of the third term of study. The thesis proposal must normally be presented no later than the fourth term of study.

Students admitted with a B.A. (Honours) degree and registered part-time must normally complete the comprehensive examination requirement by the end of the ninth year or after twenty-seven terms of study after their initial part-time registration. The thesis proposal must normally be presented no later than ten years

or thirty terms of study following the initial part-time registration.

Students admitted with a master's degree and registered part-time must normally complete the comprehensive examination requirement by the end of the fourth year or after twelve terms of study after the initial part-time registration. The thesis proposal must normally be presented no later than five years or fifteen terms of study after the initial part-time registration.

### Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

FW,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

A prerequisite for all graduate-level courses is appropriate linguistic ability and approval of Comparative Literary Studies.

A student will not receive credit for both a 0.5 credit course and a 1.0 credit course which bears the same topic title.

Comparative Literary Studies 17.501F1

**Comparative Literature: History and Theory**  
Major developments within discipline of comparative literature from 19th to late 20th century; contributions of discipline to literary criticism; issues and problems today.

Prerequisite: Permission of Comparative Literary Studies.

Comparative Literary Studies 17.502W1

#### **Problems in the Theory of Literature**

Study of key issues arising from theoretical consideration of literary studies in modern or pre-modern criticism. (Also listed as English 18.500 and as Comparative Literary Studies 17.630)

Prerequisite: Permission of Comparative Literary Studies.

Comparative Literary Studies 17.521F1

#### **Literary History: Periods, Styles and Movements I**

For 2001-2002, the topic is: Texts and Images from Antiquity to the Renaissance. The relationship between texts and images in the Western Tradition: Theoretical perspectives and historical survey. The "sister arts" in ancient rhetoric; memory and imagery. Case studies: from the pagan gods of Antiquity to Renaissance emblemata. The Canon vs. "Popular Culture". Prerequisite: Permission of Comparative Literary Studies

Comparative Literary Studies 17.522F1 or W1  
**Literary History: Periods, Styles and Movements II**

For 2001-2002, the topic is: Texts and Images from Antiquity to the Renaissance. The relationship between texts and images in the Western Tradition. Theoretical perspectives and historical survey. The "sister arts" in ancient rhetoric; memory and imagery. Case studies: from the pagan gods of Antiquity to Renaissance emblemata. The Canon vs. "Popular Culture". (Also listed as Comparative Literary Studies 17.655)

Comparative Literary Studies 17.523 F1 or W1  
**Literary History: Themes and Genres**

For 2001-2002, the topic is: Discourse Analysis I: Classical and Medieval Rhetoric. Study of persuasion by the Greeks; 20th Century "discourse analysis". Aristotle's division of discourse into deliberative, forensic and epideictic prefigures distinction between oratory and literature, argumentation and poetry, historiography and fiction, mimesis and diegesis. Classical and Medieval examples of theory and practice.

Prerequisite: Permission of Comparative Literary Studies

Comparative Literary Studies 17.532F1  
**Studies in the Literature of Identity**

For 2001-2002, the topic is: Female Identity: Writing by Women in the Twentieth Century. Gender and narrativity, women's space, marginalization, women and madness, and mothers and daughters in writing by women in northern Europe and North America. A cross-cultural perspective with reference to poststructuralist literary theory, including feminist criticism.

Prerequisite: Permission of Comparative Literary Studies

Comparative Literary Studies 17.554F1 or W1  
**Comparative Perspectives on Literature and Globalization I**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.556F1 or W1  
**Comparative Perspectives of Literature and Globalization II**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.558W1  
**Comparative Canadian Literature**

For 2001-2002, the topic is: Canadian Women's Autobiography. A study of narrative structures and of the markers of gender, as well as of national, ethnic, race and class difference in selected autobiographical works by English-Canadian and Québécois women writers.

A knowledge of French is recommended but not required.

Prerequisite: Permission of Comparative Literary Studies.

Comparative Literary Studies 17.580F1

**Seminar in Comparative Literary Studies**

For 2001-2002, the topic is: Freudian Impulses on Literature and Culture. A critical examination of Sigmund Freud's intellectual heritage, including N. Abraham, B. Bettelheim, J. Kristeva, J. Lacan, J.-B. Pontalis and S. Zizek, focusing on psychoanalytic problems of literary and cultural studies.

Prerequisite: Permission of Comparative Literary Studies.

Comparative Literary Studies 17.582W1

**Seminar in Comparative Literature**

For 2001-2002, the topic is: The Francophonie. This course examines the nature of diversity in the Francophonie. Plays from Quebec, Martinique and Haiti will be analysed as reflecting the specificity of three countries in which French co-exists with another language (English or Creole) which affects cultural production.

Prerequisite: Permission of Comparative Literary Studies

Comparative Literary Studies 17.593F2, W2, S2  
**Comprehensives**

Comparative Literary Studies 17.597F1, W1, S1

**Directed Special Studies**

From time to time, students whose main interests are not covered by courses offered in a given year may pursue independent research, subject to the availability of a qualified adviser and relevant library resources at Carleton. Interested students should apply directly to the supervisor of graduate studies.

Precludes additional credit for Comparative Literary Studies 17.598.

Comparative Literary Studies 17.599F4, W4, S4

**M.A. Thesis**

Comparative Literary Studies 17.601F1

**Doctoral Seminar I: Literature and Other Discourses**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.602 W1

**Doctoral Seminar II: Literature and Other Discourses**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.603F1

**Modernism**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.604F1

**Postmodernism**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.610W1

**Narrative and Non-Fiction**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.620F1 or W1

**Literary History**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.625F1 or W1

**Hermeneutics and Aesthetic Experiences of Literature**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.630W1

**Text Theory**

Topic may vary from year to year.

(Also listed as Comparative Literary Studies 17.502 and as English 18.500)

Prerequisite: Permission of Comparative Literary Studies.

Comparative Literary Studies 17.635F1 or W1

**Translation Studies: Theory and Practice**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.640F1 or W1

**Gender and Literature**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.650W1

**Rhetoric and Literature**

Topic may vary from year to year.

(Also listed as Comparative Literary Studies 17.523W1)

Prerequisite: Permission of Comparative Literary Studies

Comparative Literary Studies 17.655 W1

**Iconicity and Medieval and Early Renaissance Literature**

Topic may vary from year to year.

(Also listed as Comparative Literary Studies 17.522)

Prerequisite: Permission of Comparative Literary Studies.

Comparative Literary Studies 17.660 W1

**Sign, Language and Society**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.683F1

**Seminar in Comparative Literary Studies**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.684W1

**Seminar in Comparative Literary Studies**

Topic may vary from year to year.

Students should consult Comparative Literary Studies regarding the topic offered.

Comparative Literary Studies 17.693F2,W2,S2

**Comprehensives**

Comparative Literary Studies 17.699F, W, S  
**Ph.D. Thesis**

# Ottawa-Carleton Institute for Computer Science

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Université d'Ottawa  
University of Ottawa



Carleton University

## The Institute

**Director of the Institute, P. Bose**

**Associate Director of the Institute, S. Matwin**

Students who wish to pursue studies in computer science leading to an M.C.S. or a Ph.D. degree can do so in a joint program offered by the School of Information Technology and Engineering at the University of Ottawa and the School of Computer Science at Carleton University under the auspices of the Ottawa-Carleton Institute for Computer Science. The Institute is responsible for supervising the program and for providing a framework for interaction between the two departments at the research level. In addition to the faculty members from the two computer science departments, the Institute also has members with computer science expertise from other departments.

The M.C.S. is also available as part of ConGESE (Consortium for Graduate Education in Software Engineering), a collaborative program offering a specialization in software engineering. This program is geared towards software professionals working for participating industrial partners. The ConGESE program imposes further regulations and requirements on the existing program. The degree will in each case specify the discipline of the participating unit with Specialization in Software Engineering. Additional information is available from the graduate supervisor and on the Web (by searching for Congese).

Requests for information, and completed applications, should be sent to the director or associate director of the Institute. A joint admissions committee examines all applications and assigns students to the most appropriate campus and supervisor.

## Members of the Institute

The "home" department of each member is indicated by (SITE) for the School of Information Technology and Engineering, University of Ottawa; (ADM) for Faculty of Administration, University of Ottawa; (MCG) for the Department of Mechanical Engineering, University of Ottawa; (SCS) for the School of Computer Science, Carleton University; (MAT) for the School of Mathematics and Statistics, Carleton University; (SCE) for the Department of Systems

and Computer Engineering, Carleton University; (C) for the Department of Civil and Environmental Engineering, Carleton University; (BUS) for the School of Business, Carleton University.

- M.D. Atkinson, *Complexity, Algorithms, Computational Algebra* (SCS - Adjunct)
- M. Barbeau, *Telecommunications Software, Distributed Systems, Mobile and Wireless Networks* (SCS)
- K.J. Barker, *Natural Language Processing, Knowledge Acquisition, Machine Learning, Artificial Intelligence* (SITE)
- C. BarriPre, *Natural Language Processing, Lexical Knowledge Bases, Computational Lexicography, Knowledge Acquisition and Representation* (SITE)
- G. von Bochmann, *Communication Protocols, Software Engineering, Formal Specifications, Verification and Validation, Distributed Applications and Multimedia, Quality of Service Management, High-Speed Networks, Real-Time Systems* (SITE)
- F. Bordeleau, *Software Engineering, Object-Oriented Modelling, Distributed Objects, Agent Systems, Distributed System Development, Scenario-Based Description Techniques, Telecommunication, Formal Methods* (SCS)
- P. Bose, *Applied Geometric Computing, Computational Geometry, Data Structures, Algorithms Design and Analysis, Randomized Algorithms, Graph Theory* (SCS)
- M. Bouchard, *Signal Processing and Neural Networks applied to Speech, Audio and Acoustics* (SITE)
- Sylvia Boyd, *Combinatorial Optimization, Algorithm Design and Analysis, Graph Theory, Polyhedral Combinatorics* (SITE)
- L. Briand, (SCE)
- R.J.A. Buhr, *Software Design, Design Visualization, Real-Time and Distributed Systems, Object-Oriented Systems* (SCE)
- J.W. Chinneck, *Operations Research, Applied Optimization* (SCE)
- J.-P. Corriveau, *Cognitive Science, Natural Language Understanding, Cognitive Science, Object-Oriented Technology, CASE Tools* (SCS)
- S.P. Dandamudi, *Parallel and Distributed Systems, Database Systems, Performance Evaluation, Computer Architecture, Operating Systems* (SCS)
- N.W. Dawes, *Diagnosis and Pattern Recognition* (SCE - Adjunct)
- Frank Dehne, *Computational Geometry, VLSI Algorithms* (SCS)

- D. Deugo, *Large-Scale Distributed Object Computing, Evolutionary Computation (Genetic Algorithms, Genetic Programming, Artificial Life), Object-Oriented Systems (SCS)*
- J.D. Dixon, *Algorithms in Algebra and Number Theory, Complexity Theory, Group Theory and Representation (MAT)*
- E. Dubois, *Digital Signal Processing, Multidimensional Signal Processing, Data Compression, Source Coding, Image/Video Processing and Coding (SITE)*
- A.E.F. Fahim, *Nonlinear Optimization, Computer Aided Design and Manufacturing (CAD/CAM) Methodology and Software, Flexible Manufacturing Cell (FMC) Control Environment, Robot Control, Expert Systems for Design and Manufacturing (MCG)*
- A. P. Felty, *Theorem Proving, Automated Deduction, Formal Methods in Software Engineering, Computational Logic (SITE)*
- Frantisek Fiala, *Combinatorial Algorithms, Vehicle Routing Problems, Software Tools (SCS)*
- P. Flocchini, *Distributed Computing, Distributed Algorithms, Sense of Direction, Compact Routing, Cellular Automata, Discrete Chaos (SITE)*
- N. Georganas, *Computer Communications, Multimedia Communications (SITE)*
- V. Groza (SITE)
- R.C. Holte, *Artificial Intelligence, Machine Learning, Knowledge Compilation (SITE)*
- N.M. Holtz, *Computer-Assisted Structural Engineering (C)*
- D. J. Howe, *Automated Reasoning, Applied Logic, Formal Methods in Software Engineering, Programming Languages (SCS)*
- D.I.-A. Ionescu, *Computers, Artificial Intelligence, Image Processing, Discrete Event and Real-Time Systems (SITE)*
- G.M. Karam, *Concurrent and Real-Time Systems, Software Engineering, Communications Software (SCE – Adjunct)*
- A. Karmouch, *Multimedia Communications, Multimedia Real-Time Distributed Information Systems and Databases (SITE)*
- G.E. Kersten, *Knowledge-Based Systems, Intelligent Decision Support, Problem Structuring and Representation (BUS)*
- Evangelos Kranakis, *Cryptography, Computational Number Theory, Combinatorial Analysis, Computational Geometry, Distributed Computing, Distributed and Data Networks (SCS)*
- Moshe Krieger, *Real-Time System Design, Microprocessor-Based Systems, Software Engineering, Computer Architecture (SITE)*
- Danny Krizanc, *Parallel and Distributed Computing, Analysis of Algorithms and Use of Randomization in Computation (SCS)*
- T. Kunz, *Wireless and Mobile Computing, Load Balancing in Distributed Systems, Distributed Programming Environments for Parallel and Distributed Systems, Distributed Systems Management, Parallel and Distributed Debugging, Program Understanding (SCE)*
- R. Laganieri, *Computer Vision, Image Processing (SITE)*
- W.R. LaLonde, *Object-Oriented Systems, Design and Analysis Tools, Animation Systems (SCS)*
- T.C. Lethbridge, *Human Computer Interaction/User Interfaces, Software Engineering Tools and Work Practices, Software Reverse Engineering, Knowledge Representation (SITE)*
- Luigi Logrippo, *Telecommunications Software Engineering, Software Specification and Verification with Emphasis on Distributed Software (SITE)*
- A. Maheshwari, *Data Structures and Algorithms, Parallel Computation, Computational Geometry, Graph Algorithms (SCS)*
- S.A. Mahmoud, *Wireless Communication Systems, Software Project Management, Protocols for High Speed Networks, Speech Processing and Computer Network Design (SCE)*
- S. Majumdar, *Parallel and Distributed Systems, Performance Evaluation, Operating Systems (SCE)*
- Makaroff, D.J., *Distributed Systems, Multimedia Servers, Networks (SITE)*
- D. Makrakis, (SITE)
- M. Marchand, *Artificial Neural Networks, Machine Learning (and Applications), Pattern Recognition (SITE)*
- S.J. Matwin, *Artificial Intelligence, Knowledge-Based Systems, Machine Learning, Software Reuse (SITE)*
- D. R. McDonald, *Applied Probability, Rare Events in Queueing Networks, Applications to Telecommunications (SITE)*
- L.R. Morris, *Digital Signal Processing, Speech Analysis and Synthesis, Computer Graphics (SCE-Adjunct)*
- B.C. Mortimer, *Combinatorics, Algorithms, Groups Theory (MAT)*

- J. E. Neilson, *Distributed and Parallel Computing including: Operating Systems, Performance Models, and Design Tools; Simulation and Prototyping Methodology, Computer Systems Performance Engineering* (SCS-Adjunct)
- L.D. Nel, *Object-Oriented Programing and Object-Oriented Development, Computer Music and Multimedia* (SCS)
- J.B. Oommen, *Learning Systems, Stochastic Automata, Syntactic Pattern Recognition, Adaptive Data Structures, Neural Networks* (SCS)
- Franz Oppacher, *Artificial Intelligence, Genetic Algorithms, Evolutionary Computing, Machine Learning* (SCS)
- L. Orozco-Barbosa, *Computer Networks, Performance Evaluation* (SITE)
- Bernard Pagurek, *Communications Network Management, Artificial Intelligence and Fault Management, Knowledge-Based Software Debugging* (SCE)
- P. Payeur (SITE)
- D. Petriu (SCE)
- E.M. Petriu, *Virtual Environments, Robotic Sensing and Perception, Neural Networks, Fuzzy Systems* (SITE)
- R.L. Probert, *Testing of Communications Protocols and Communications Software, Distributed Software Engineering, Software Design for Testability* (SITE)
- J.R. Pugh, *Object-Oriented Development Environments* (SCS - Adjunct)
- Jacques Raymond, *Teleeducation, Intranet* (SITE)
- Ivan Rival, *Combinatorial Optimization, Ordered Sets, Scheduling, Sorting, Search, Graph Theory Visualization, Software Engineering* (SITE)
- G. Roth, *Computer Vision, Image Processing, Evolutionary Algorithms, Virtual Reality and Multi-Media, Computer Graphics* (SCS)
- J.-R. Sack, *Algorithms and Complexity, Computational Geometry, Geographic Information Systems, Parallel Computing, Graphics* (SCS)
- Nicola Santoro, *Distributed Computing, Fault-Tolerance, Discrete Chaos, Reactive Environments* (SCS)
- Philip Scott, *Logic, Theoretical Computer Science, Category Theory* (SITE)
- B. Selic, *Software Engineering, Real-Time Systems, Object-Oriented Modeling, Quality of Service* (SCS)
- J.B. Sidney, *Combinatorial Optimization, Job Shop Scheduling* (SITE)
- D.R. Skuce, *Applications of Artificial Intelligence, Expert Systems, Intelligent Help and Text Retrieval, Natural Language Understanding* (SITE)
- Ivan Stojmenovic, *Parallel Algorithms, Neural Networks, Combinatorial Algorithms, Evolutionary Computing, Multiple-Valued Logic* (SITE)
- Stan Szpakowicz, *Computational Linguistics, Knowledge Acquisition, Decision Support Systems* (SITE)
- D.A. Thomas, *Artificial Intelligence, Fifth Generation Machines* (SCS - Adjunct)
- Hasan Ural, *Software Reliability, Verification and Testing, Communication Protocols, Distributed Computing* (SITE)
- Jorge Urrutia, *Design and Analysis of Algorithms, Graph Theory, Combinatorial Optimization, Distributed Algorithms, Combinatorial Geometry and Algorithms* (SITE)
- Rémi Vaillancourt, *Differential Equations, Numerical and Applied Mathematics, Scientific Computation, Image Compression (JPEG, MPEG), Wavelets, Chirplets* (SITE)
- G.M. White, *Networking and Protocol Design, Office Automation and Speech Processing, Micro-Computer Based Systems* (SITE)
- C.M. Woodside, *Performance Modelling, Performance of Distributed Software, Software Design, Queuing Theory* (SCE)
- D. J. Wright, *Voice Over Packet Networks, Business Case for Broadband Networks, Electronic Commerce, Telelearning* (SITE)
- T. Yamakami, *Quantum Complexity, Theory of Relativization, Cryptography, Average-Case Complexity, Logic, and Recursion Theory* (SITE)
- O. Yang, *Design, Modeling, Analysis and Performance Evaluation of Computer Communication Networks and their Architectures* (SITE)
- Negib Zaguia, *Optimization, Theory of Algorithms, Theory of Ordered Sets* (SITE)
- Marek B. Zaremba, *Hybrid Intelligent Systems, Adaptive Control, Machine Learning, Distributed Processing, Neural Networks* (SITE)

## Master of Computer Science

### Admission Requirements

Applicants should have an Honours bachelor's degree in computer science or the equivalent, with at least high honours standing. By equivalent is meant an Honours degree in a program which includes at least twelve computer science half credits, two of which must be at the 400-level, as well as eight half credits in math-

ematics, one of which must be at the 300- or 400-level. These courses must include the topics indicated below:

#### *Computer Science*

Data structures/file management, operating systems, computer architecture, algorithm design and analysis, assembly language and two high-level languages

#### *Mathematics*

Calculus, linear algebra, algebraic structures or discrete mathematics, probability and statistics, numerical analysis. Applicants who have a general (3 year) bachelor's degree, or who otherwise lack the required undergraduate preparation, may be admitted to a qualifying-year program. Refer to the General Regulations section of this Calendar for regulations governing the qualifying year.

### **Program Requirements**

The program includes graduate study and research in four broad areas identified as follows:

- \* Software Engineering
- \* Theory of Computing
- \* Computer Applications
- \* Computer Systems

Within these areas, the program emphasizes problems of current practical significance and has close links to the scientific and industrial communities.

Normally, students in the program will be expected to complete a thesis; however, students who have substantial relevant work experience may be permitted to take the non-thesis option, which must include a graduate research project course. Each candidate submitting a thesis will be required to undertake an oral defence of the thesis.

Students in the thesis option must take 2.5 credits, fulfill the graduate seminar requirement, and complete a thesis. Students in the non-thesis option must take 4.0 credits, plus a graduate project (a project is equal to 1.0 credit and may be completed in one or two terms), and fulfill the graduate seminar requirement. The course selections must be approved by the student's academic adviser, and must include at least:

- \* 0.5 credit in software engineering
- \* 0.5 credit in the theory of computing
- \* 0.5 credit in either computer applications or computer systems

The graduate seminar requirement includes a seminar presentation and participation in at least ten sessions in the joint graduate student seminar series.

Both course and thesis work may be completed either by full-time or part-time study.

A candidate may be permitted to carry out thesis work off campus provided that suitable arrangements are made for supervision and experimental work, and prior approval is given by the Institute.

### **Guidelines for Completion of Master's Degree**

The following completion times are estimates only, based on full-time study, and are intended to provide guidance only.

Students are strongly urged to check with the supervisor of graduate studies to determine the exact requirements of the degree program and other related information. Part-time students should calculate the completion times requirement by doubling the time estimates given below.

Students should complete the course work within the first two terms.

Selection of courses should be done in consultation with the student's faculty advisor. A thesis supervisor and a thesis topic must be completed time for the M.C.S. degree is four selected by the end of the second term. The supervisor of graduate studies should be formally notified of this selection. The expected to six terms of full-time study depending on the type of thesis and the area of research.

### **Doctor of Philosophy**

#### **Admission Requirements**

A master's degree in Computer Science (or the equivalent) with high second-class standing is normally required for admission into the Ph.D. program. Students who are currently registered in the M.C.S. program may, in exceptional cases, be permitted to transfer into the Ph.D. program if they have completed all course requirements with at least high second-class standing and demonstrate significant promise for advanced research.

#### **Program Requirements**

- \* A minimum of 2.5 credits, at the graduate level which must include: 0.5 credit in software engineering; 0.5 credit in the theory of computing; 0.5 credit in either computer applications or computer systems
- \* Presentation of at least two seminars in the Ottawa-Carleton Institute for Computer Science seminar series
- \* A comprehensive examination involving breadth and depth components
- \* A written thesis proposal defended at an oral examination

\* A research thesis, defended at an oral examination

## Guidelines for Completion of the Doctoral Degree

The following completion times are estimates based on full-time study, and are intended to provide guidance only.

During the first term, the thesis supervisor and the student must select courses. Course selection must be submitted for approval to the director or associate director of the Institute. An advisory committee comprised of three to five faculty members must be established before the end of the second term. The committee is responsible for the comprehensive examination, the thesis proposal, and for guiding the student's research. The advisory committee must be approved by the director or associate director of the Institute. Comprehensive examinations must be taken within the first 12 months. All course requirements must be completed within the first 24 months. The student must submit a written thesis proposal and defend it in an oral examination. The expected completion time for the Ph.D. program is nine to twelve terms depending on the type of thesis and the area of research. Before the completion of the program, the student is expected to present at least two seminars in the Ottawa-Carleton Institute for Computer Science seminar series.

## Residence Requirement

Students must fulfill a residence requirement of at least four terms of full-time study.

## Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the Summer.

The courses in the following list are offered by various departments indicated by the prefix of the course code as follows:

Carleton University  
70 School of Mathematics and Statistics  
94 Department of Systems and Computer Engineering  
95 School of Computer Science  
97 Department of Electronics

CSI School of Information Technology and Engineering  
ELG School of Information Technology and Engineering  
MAT Department of Mathematics

## Software Engineering

- 94.480 Software Engineering
- 94.531 (ELG6131)
- 94.571 (CSI5117)
- 94.573 (ELG6173)
- 94.578 (ELG6178)
- 94.579 (ELG6179)
- 94.586 (ELG6186)
- 95.501 (CSI5113)
- 95.514 (CSI5314)
- 95.516 (CSI5123)
- 95.540 (CSI5310)
- 95.543 (CSIXXXX)95.614 (CSI7314)
- 95.663 (CSI7161)
- CSI5107 (95.569) Program Construction and Fault Tolerance
- CSI5109 (95.571) Specification Methods for Distributed Systems
- CSI5111 (95.551) Software Testing: Theory and Practice
- CSI5118 (95.532) Automated Verification and Validation of Software
- CSI5122 (95.531) Software Usability
- CSI5181 (95.575) Artificial Intelligence in Software Engineering
- CSI5184 (95.584) Logic Programming
- CSI5507(95.569) La Construction et la Tolérance aux Fautes des Programmes
- CSI5509 (95.571) Méthodes Algébriques pour la Spécification de Systèmes Répartis
- CSI5518(95.578) Conception des compilateurs et traducteurs
- CSI5584 (95.584) Programmation logique

## Theory of Computing

- 70.482 Introduction to Mathematical Logic
- 70/95.483 Topics in Applied Logic
- 70/95.484 Design and Analysis of Algorithms
- 70/95.485 Theory of Automata
- 70/95.486 Numerical Linear Analysis
- 95.409 Introduction to Parallel and Systolic Computing
- 70.565 (MAT5165)
- 70.585 (MAT5308)
- 94.505 (ELG6105)
- 94.506
- 94.507
- 95.503 (CSI5308)
- 95.505 (CSI5390)
- 95.508 (CSI5164)
- 95.517 (CSI5185)
- 95.523 (CSI5173)
- 95.544 (CSIXXXX)
- 95.573 (CSI5163)
- 95/70.587 (CSI5104)
- 95.661 (CSI7160)
- 95.662 (CSI7170)
- CSI5101 (95.561) Formal Models of Computational Systems
- CSI5107 (95.569) Program Construction and Fault Tolerance
- CSI5108 (95.570) Software Specification and Verification

- CSI5110 (95.577) Principles of Formal Software Development
- CSI5162 (95.572) Order: Its Algorithms and Graphical Data Structures
- CSI5164 (95.508) Computational Geometry
- CSI5165 (95.579) Combinatorial Algorithms
- CSI5166(95.585) Applications of Combinatorial Optimization
- CSI 5169 (95.534) Wireless Networks and Mobile Computing
- CSI5174 (95.564) Validation Methods for Distributed Systems
- CSI5367 (95.530) Structure in Complexity Theory
- CSI5507 (95.569) La Construction et la Tolérance aux Fautes de Programmes
- CSI5508 (95.570) Spécification et Vérification de Logiciels
- CSI5510 (95.577) Principes de développement formel de logiciels
- CSI5565 (95.579) Algorithmes Combinatoires

### **Computer Applications**

- 70/95.486 Numerical Linear Algebra
- 94.405 Discrete Simulation and Its Applications
- 95.402 Computer Graphics
- 95.403 Transaction Processing Systems
- 95.416 Knowledge-Based Systems and Symbolic Machine Learning
- 96.417 Adaptive Algorithms and Intelligent Agents
- 70.569 (MAT5301)
- 70.581 (MAT5303/ADM6385)
- 70.583 (MAT5304/ADM6386)
- 70.584 (MAT5307/ADM6387)
- 70.586 (MAT5180)
- 70.588 (MAT5305)
- 70.589 (MAT5306)
- 94.501 (ELG6101)
- 94.503 (ELG6103)
- 94.504 (ELG6104)
- 94.505 (ELG6105)
- 94.535 (ELG6135)
- 94.538 (ELG6138)
- 94.542 (ELG6142)
- 94.561 (ELG6161)
- 94.563 (ELG6163)
- 95.506 (CSI5306)
- 95.510 (CSI5180)
- 95.513 (CSI5313)
- 95.524 (CSI5124)
- 95.526 (CSI5183)
- 95.541 (CSI5389/5789)
- 95.664 (CSI7162)
- CSI5114 (95.554) Automated Office Systems
- CSI5125 (95.517) Simulation
- CSI5161 (95.566) Topics in System Simulation and Optimization
- CSI5162 (95.572) Order: Its Algorithms and Graphical Data Structures
- CSI5181 (95.575) Artificial Intelligence Applications in Software Engineering

- CSI5304 (95.562) Knowledge Engineering
- CSI5380 (95.545) Systems and Architectures for Electronic Commerce
- CSI5386 (95.555) Natural Language Processing
- CSI5387 (95.576) Data Mining and Concept Learning
- CSI5388 (95.581) Topics in Machine Learning
- CSI5514 (95.554) Bureautique
- CSI5580 (95.510) Sujet en intelligence artificielle
- CSI5581 (95.575) Applications de l'intelligence artificielle dans le développement des systèmes
- CSI5787 (95.576) Apprentissage Symbolique Automatique
- ELG5162 (92.505) Knowledge-Based Systems: Principles and Design
- ELG5163 (92.510) Machine Vision
- ELG5196 (92.579) Automata and Neural Networks: Applications in Machine Perception
- ELG5199 (92.514) Design of Multimedia Distributed Database Systems
- ELG5373 (92.515) Secure Communications and Data Encryption

### **Computer Systems**

- 94.457 Introduction to the Architecture of Computer Systems
- 94.470 Introduction to Telecommunications
- 95.408 Performance Modelling
- 94.506 (ELG6106)
- 94.511 (ELG6111)
- 94.519 (ELG6119)
- 94.521 (ELG6121)
- 94.527 (ELG6127)
- 94.538 (ELG6138)
- 94.558 (ELG6158)
- 94.563 (ELG6163)
- 94.571 (CSI5117)
- 94.576 (ELG6176)
- 94.577 (ELG6177)
- 94.581 (ELG6181)
- 94.587 (ELG6187)
- 95.503 (CSI5308)
- 95.509 (CSI5141)
- 95.511 (CSI5311)
- 95.512 (CSI5312)
- 95.515 (CSI5132)
- 95.517 (CSI5185)
- 95.523 (CSI5173)
- 95.541 (CSI5389/5789)
- 95.542 (CSIXXXX)
- 95.543 (CSIXXXX)
- 95.574 (CSI5131)
- 95.610 (CSI7131)
- 95.662 (CSI7170)
- 95.665 (CSI7163)
- 97.587 (ELG6387)
- CSI5109 (95.571) Specification Methods for Distributed Systems
- CSI5114 (95.554) Automated Office Systems
- CSI5133 (95.568) Simulation and Testing of Logic Circuits

- CSI 5169 (95.534) Wireless Networks and Mobile Computing  
 CSI5170 (95.580) Distributed Data Processing  
 CSI5171 (95.533) Network Architectures, Services, Protocols and Standards  
 CSI5174 (95.564) Validation Methods for Distributed Systems  
 CSI5380 (95.545) Systems and Architectures for Electronic Commerce  
 CSI5509 (95.571) Méthodes Algébriques pour la Spécification de Systems Répartis  
 CSI5514 (95.554) Bureautique  
 CSI5535 (95.565) Les machines de haut niveau  
 ELG5192 (92.577) Microprocessor-based Systems  
 ELG5193 (92.578) Multi-microprocessor Systems  
 ELG5194 (92.573) Design and Testing of Reliable Digital Systems  
 ELG5197 (92.512) Introduction to Embedded Systems  
 ELG5198 (92.513) Parallel Processing with VLSI  
 ELG5374 (92.567) Computer-Communication Networks  
 ELG5378 (92.559) Image Processing Techniques and Image Communications

**Theses, Projects and Topics**

- 95.590 (CSI5140)  
 95.591 (CSI5901)  
 95.592 (CSI5900)  
 95.593 (CSI6900)  
 95.595 (CSI7999)  
 95.661 (CSI7160)  
 95.662 (CSI7170)  
 95.663 (CSI7161)  
 95.664 (CSI7162)  
 95.665 (CSI7163)  
 95.691 (CSI7901)  
 95.692 (CSI7900)  
 95.699 (CSI9999)  
 CSI9998 Examen général de doctorat/Ph.D. Comprehensive Examination

## Computer Science

Herzberg Building 5302  
Telephone: 520-4333  
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E-mail: [scs@carleton.ca](mailto:scs@carleton.ca)

### The School

**Director of the School,** F. Dehne

**Supervisor of Graduate Studies,** P. Bose

The School of Computer Science offers degrees leading to a Master of Computer Science or a Ph.D. in Computer Science through the Ottawa-Carleton Institute for Computer Science. The Institute is jointly administered by the School and the School of Information Technology and Engineering at the University of Ottawa. For further information, including admission and program requirements, see p.137.

A program leading to the M.Sc. in Information and Systems Science is offered in cooperation with the School of Mathematics and Statistics and the Department of Systems and Computer Engineering. For further information see p.209.

The research expertise of the School's faculty is concentrated in the following areas:

#### *Algorithms and Complexity*

Computational geometry and algebra, combinatorial optimization, distributed and parallel algorithms, multi-dimensional data structures, stochastic automata, graph theory, partial orders.

#### *Intelligent Systems*

Expert systems, knowledge acquisition tools, knowledge based assistants, connectionism and neural networks, natural language understanding, learning and adaptability, robotics, pattern recognition.

#### *Object-Oriented Systems*

Visual programming, filing systems, databases, user interfaces, simulation, animation, software engineering, office automation.

#### *Distributed Systems*

Operating systems, databases, systolic architectures, tools for performance studies, distributed programming languages, parallel computing, communication complexity, networks.

In addition to its undergraduate laboratories, the School maintains a number of state-of-the-art research laboratories all integrated via a department and campus area network.

### Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

The complete list of courses available through the Ottawa-Carleton Institute for Computer Science is given on p. 141. The following courses are offered by the School of Computer Science.

Computer Science 95.501F1 (CSI5113)

#### **Foundations of Object-Oriented Programming Languages**

Object-oriented programming, design, and implementation from first principles to advanced concepts. Possible topics include: need-driven designing, metalevel programming, visual programming, event-oriented programming, web-related applications, subtyping/subclassing/isa relationships, futures and proxies, distributed applications.

Prerequisite: Computer Science 95.307 ★ or the equivalent.

Computer Science 95.503F1 (CSI5308)

#### **Principles of Distributed Computing**

Formal models; semantics of distributed computations; theoretical issues in design of distributed algorithms; computational complexity; reducibility and equivalence of distributed problems. Related topics: systolic systems and computations, oligarchical systems and control mechanisms.

Prerequisite: Computer Science 95.401 ★ or equivalent.

Computer Science 95.505F1 (CSI5390)

#### **Learning Systems for Random Environments**

A course on computerized adaptive learning for random environments and its applications. Topics include a mathematical review, learning automata which are deterministic/stochastic, with fixed/variable structures, of continuous/discretized design, with ergodic/absorbing properties and of estimator families.

Prerequisite: Mathematics 70.260 or 70.350, or Engineering 94.553 or the equivalent.

Computer Science 95.506W1 (CSI5306)

#### **Natural Language Understanding**

Introduction to current research in natural language processing, with emphasis on semantics and pragmatics rather than syntactic issues, and on analyzing text rather than single sentences. Topics include: meaning representation, representation of pragmatic information,

speech act theory, flexible parsing, anaphor and reference, contextual meaning.  
Prerequisite: Computer Science 95.407★ or 95.416★ or the equivalent.

Computer Science 95.508F1 (CSI5164)

### **Computational Geometry**

A study of the design and analysis of algorithms to solve geometric problems with an emphasis on applications such as robotics, graphics, and pattern recognition. Topics include: visibility problems, hidden line and surface removal, path planning amidst obstacles, convex hulls, polygon triangulation, point location.

Prerequisite: Computer Science 95.384★ or the equivalent.

Computer Science 95.509F1 (CSI5141)

### **Associative Data Structures and Advanced Databases**

Concepts and advanced topics in the design, implementation and analysis of physical storage schemes with emphasis on their application to specialized database and information retrieval systems. Topics include: associative searching techniques; multidimensional storage structures; algorithms for spatial data modeling; formulation and optimization of database queries.

Prerequisites: Computer Science 95.305★ and 95.384★, or the equivalent.

Computer Science 95.510W1 (CSI5180)

### **Topics in Artificial Intelligence**

A programming-oriented introduction to selected topics in Artificial Intelligence (A.I.). Possible topics include: A.I. programming techniques, pattern matching systems, natural language systems, expert systems, rule-based systems, constraint systems, learning systems, cerebral computation, neural networks, computer vision, and cognitive systems.

Prerequisite: Computer Science 95.407★ or 95.417★ or the equivalent.

Computer Science 95.511F1 (CSI5311)

### **Distributed Databases and Transaction Processing Systems**

Principles involved in the design and implementation of distributed databases and distributed transaction processing systems. Topics include: distributed computing concepts, computing networks, distributed and multi-database system architectures and models, atomicity, synchronization and distributed concurrency control algorithms, data replication, recovery techniques, and reliability in distributed databases.

Precludes additional credit for Computer Science 95.411★.

Prerequisites: Computer Science 95.305★, 95.401★, and 95.403★ or equivalent.

Computer Science 95.512W1 (CSI5312)

### **Distributed Operating Systems**

Design issues of advanced multiprocessor distributed operating systems: multiprocessor system architectures; process and object models; synchronization and message passing primitives; memory architectures and management; distributed file systems; protection and security; distributed concurrency control; deadlock; recovery; remote tasking; dynamic reconfiguration; performance measurement, modeling, and system tuning.

Prerequisite: Computer Science 95.300★ or the equivalent.

Computer Science 95.513W1 (CSI5313)

### **Computer Security and Cryptography**

Introduction to information security in computer and communication systems. Classical and public-key cryptosystems are overviewed. Applications to information schemes and digital signatures, key distribution and key agreement, authentication and secret sharing are also discussed. Also offered at the undergraduate level, with different requirements, as Computer Science 95.413★, for which additional credit is precluded.

Prerequisite: Computer Science 95.384★ or equivalent.

Computer Science 95.514W1 (CSI5314)

### **Object-Oriented Systems**

Advanced topics in current issues in object-oriented software development. Topics include the implementation of Object-Oriented languages, object-oriented software engineering models and methodologies, design patterns and issues relating to large scale development such as real-time performance, persistence, concurrency, and distributed objects.

Precludes additional credit for Computer Science 95.304★ and 95.414★.

Prerequisite: Computer Science 95.501 or the equivalent.

Computer Science 95.515W1 (CSI5132)

### **Parallel Processing Systems**

Introduction to the issues involved in designing and using parallel processing systems. Topics include: taxonomy and applications of parallel systems; SIMD systems; multiprocessor systems; multicomputer systems; computation versus communication issues in parallel processing; scheduling parallel systems; spinning versus blocking; interconnection networks; hot-spot contention.

Prerequisite: Permission of the School.

Computer Science 95.516W1 (CSI5123)

### **Languages for Parallel Computing**

Survey of major language paradigms for parallel computing: sequential imperative, parallel imperative, logic, functional (reduction and dataflow), object and message-passing based languages; communicating sequential processes; and massive data-level parallelism. Top-

ics include: detection, determinism, data partitioning, task scheduling, task granularity, synchronization methods, resource management, and debugging.

Prerequisite: Computer Science 95.501

Computer Science 95.517W1 (CSI5185)

### **Statistical and Syntactic Pattern Recognition**

Topics include a mathematical review, Bayes decision theory, maximum likelihood and Bayesian learning for parametric pattern recognition, non-parametric methods including nearest neighbor and linear discriminants. Syntactic recognition of strings, substrings, subsequences and tree structures. Applications include speech, shape and character recognition.

Prerequisites: Permission of the School.

Computer Science 95.523F1 (CSI5173)

### **Data Networks**

Mathematical and practical aspects of design and analysis of communication networks. Topics include: basic concepts, layering, delay models, multiaccess communication, queuing theory, routing, fault-tolerance, as well as advanced topics on high-speed networks, ATM, mobile wireless networks, and optical networks. Prerequisite: Computer Science 95.484★ or permission of the School.

Computer Science 95.524W1 (CSI5124)

### **Computational Aspects of Geographic Information Systems**

Computational perspective of geographic information systems (GIS). Data representations and their operations on raster and vector devices: e.g., quadrees, grid files, digital elevation models, triangular irregular network models. Analysis and design of efficient algorithms for solving GIS problems: visibility queries, point location, facility location.

Prerequisite: Computer Science 95.384★ or the equivalent.

Computer Science 95.526W1 (CSI5183)

### **Genetic Algorithms and Artificial Life**

Study of algorithms based upon biological theories of evolution, and their application to machine learning and optimization problems. Genetic Algorithms, Classifier Systems, Genetic Programming, and other approaches to evolutionary computation are covered in detail. Recent work in the field of Artificial Life is also studied.

Prerequisite: Computer Science 95.407★ or 95.417★ or the equivalent.

Computer Science 95.540W1 (CSI5310)

### **Software Patterns**

This course surveys current developments in software patterns, three-part rules expressing relations between software contexts, problems and solutions. Pattern categories discussed include architectural, design, analysis,

refactoring, general-purpose, anti-patterns, and idioms. Students are required to apply existing patterns and to develop and defend new ones. Prerequisites: Computer Science 95.304★ or equivalent

Computer Science 95.541 (CSI5389/5789)

### **Electronic Commerce Technologies**

Basic e-commerce models. Internet infrastructure and tools. TCP/IP, web servers, search engines. Cryptography. Public key infrastructure. Key management and certificate authorities. Secure Socket Layer and secure electronic transactions. Content presentation: XML. Open trading protocol. Intelligent mobile agents. Auctions and negotiations. Case studies.

Prerequisites: Computer Science 95.205 and 95.414

Computer Science 95.542

### **Wireless Networks and Protocols**

Focus is on the link and network layer protocols of wireless networks; applications of wireless networks may be discussed. Topics may include: protocol implementation, mobile IP, resource discovery, wireless LANs/PANs, and Spread spectrum. Precludes additional credit for 94.536.

Prerequisite: Computer Science 95.323 or equivalent.

Computer Science 95.543

### **Real-Time System Development**

An advanced course in real-time OO system development that deals with modeling systems at different abstraction levels. A systematic and traceable modeling process is introduced. Topics include: modeling notations (including UML-RT), development process, design patterns, and system testing. Expect a substantial design project. Precludes additional credit for 94.586.

Prerequisite: Computer Science 95.514 or equivalent

Computer Science 95.544

### **Computer-Aided Program Verification**

Automatic verification techniques for concurrent, reactive, and real-time programs. Possible topics: temporal logics, the basic model-checking algorithm, symbolic model checking, compositional techniques, exploiting abstraction and symmetry, models based on partial orders, model-checking for the mu-calculus, applications to communication protocols, computer security and digital circuits.

Prerequisite: Computer Science 95.404 or equivalent.

Computer Science 95.573F1 (CSI5163)

### **Algorithm Analysis and Design**

Topics of current interest in the analysis and design of sequential and parallel algorithms for non-numerical, algebraic and graph computations. Lower bounds on efficiency of algorithms.

Complexity classes. Also offered at the undergraduate level, with different requirements, as Computer Science 95.484★, for which additional credit is precluded.

Prerequisite: Permission of the School.

Computer Science 95.574W1 (CSI5131)

**Parallel Algorithms and Their Implementation**

Multiprocessor architectures from an application programmer's perspective: programming models, processor arrays and hypercube multiprocessors, algorithmic paradigms, efficient parallel problem solving, limits of parallelism, software scalability and portability. Student projects in selected application areas: image processing, robotics, graphics, animation, etc. Programming experience on parallel processing equipment.

Prerequisite: Computer Science 95.484★ or the equivalent.

Computer Science 95.582W1

**Introduction to Information and Systems Science**

An introduction to the process of applying computers in problem solving. Emphasis is placed on the design and analysis of efficient computer algorithms for large, complex problems. Applications in a number of areas are presented: data manipulation, databases, computer networks, queuing systems, optimization. (Also listed as Mathematics 70.582, Engineering 94.582, Information and Systems Science 93.582)

Computer Science 70/95.587F1 (CSI5104)

**Formal Language and Syntax Analysis**

Computability, unsolvable and NP-hard problems. Formal languages, classes of languages, automata. Principles of compiler design, syntax analysis, parsing (top-down, bottom-up), ambiguity, operator precedence, automatic construction of efficient parsers, LR, LR(O), LR(k), SLR, LL(k); syntax directed translation. Prerequisite: Computer Science 95.302★, or Mathematics 70.485★ or 70.565, or the equivalent.

Computer Science 95.590F1, W1, S1 (CSI5140)

**Selected Topics in Computer Science**

Selected topics, not covered by other graduate courses, will be offered. Details will be available at the time of registration from the school.

Computer Science 95.591F1, W1, S1 (CSI5901)

**Directed Studies (M.C.S.)**

A course of independent study under the supervision of a member of the School of Computer Science.

Computer Science 95.592F1, W1, S1 (CSI5900)  
**Graduate Project (M.C.S./M.Sc.(ISS))**

Computer Science 95.593F2, W2, S2 (CSI6900)  
**Intensive Graduate Project (M.C.S.)**

A one or two session course. For M.C.S. non-thesis option students only. Not to be combined for credit with 95.592.

Computer Science 95.595F, W, S (CSI7999)  
**M.C.S. Thesis**

Computer Science 70/94/95.598F, W, S  
**M.Sc. Thesis in Information and Systems Science**

Computer Science 95.610F1 (CSI7131)

**Advanced Parallel and Systolic Algorithms**

This course is a continuation of 95.574.

Prerequisite: Computer Science 95.574.

Computer Science 95.614F1 or W1 (CSI7314)  
**Advanced Topics in Object-Oriented Systems**

Advanced object-oriented software engineering, in particular the issues of reuse and testing. Sample topics include: interaction modeling; class and cluster testing; traceability; design patterns and testing; the C++ standard template library. Students will carry out research.

Prerequisite: Computer Science 95.514 or permission of instructor.

Computer Science 95.661F1, W1, S1 (CSI7160)  
**Advanced Topics in the Theory of Computing**

Computer Science 95.662F1, W1, S1 (CSI7170)  
**Advanced Topics in Distributed Computing**

Computer Science 95.663F1, W1, S1 (CSI7161)  
**Advanced Topics in Programming Systems and Languages**

Computer Science 95.664F1, W1, S1 (CSI7162)  
**Advanced Topics in Computer Applications**

Computer Science 95.665F1, W1, S1 (CSI7163)  
**Advanced Topics in Computer Systems**

Computer Science 95.691F1, W1, S1 (CSI7901)  
**Directed Studies (Ph.D.)**

Computer Science 95.692F1, W1, S1 (CSI7900)  
**Graduate Project (Ph.D.)**

Computer Science 95.699F, W, S (CSI9999)  
**Ph.D. Thesis**

# Institute for Comparative Studies in Literature, Art and Culture: Cultural Mediations

Dunton Tower 1424  
Telephone: 520-2177  
Fax: 520-2564  
Email: icslac@carleton.ca

## The Institute

**Director of the Institute:** Christopher Faulkner

**Supervisor of Ph.D. Studies:** Paul Keen

The Institute for Comparative Studies in Literature, Art and Culture offers a program of study and research leading to the Doctor of Philosophy in Cultural Mediations.

The Department of English Language and Literature, the Department of French, the programs in Art History, Film Studies and Music of the School for Studies in Art and Culture, and the program in Comparative Literary Studies participate in the doctoral program.

## Doctor of Philosophy

The program is designed to support work in cultural theory of the twentieth-century and the analysis of a variety of cultural practices across and between the participating disciplines. The program addresses those issues in cultural theory of the twentieth-century that inform interdisciplinary work today in literature, film, music, art and new media: the nature of the text and textuality; the nature of representation, interpretation, meaning and affect; cultural identity and hybridity; the role of technologies of production and reception; the formation of the subject and modes of subjectivity; the functioning of ideology; the meaning and ethics of cultural value. Specific works of literature, film and other cultural practices, including new media, will be studied in relation to questions of theory.

There are four fields of study in the program:

- \* Literary Studies
- \* Visual Culture
- \* Musical Culture
- \* New Technologies

## Admission Requirements

The normal requirement for admission to the Ph.D. program in either a full-time or part-time capacity is an M.A. (or a recognized equivalent) in a discipline appropriate to the interdisciplinary strengths of the program. A GPA of 10.0 (A-) or better is normally required of course work completed at the Master's level.

Appropriate disciplines might include English or French Literature, Art History, Film Studies, Music, Comparative Literature, Anthropology, Canadian Studies, Communication, Geography, History, Philosophy, Sociology, Gender Studies.

## Program Requirements

Students admitted to the Ph.D. program in Cultural Mediations are required to complete a total of 10.0 credits as follows:

- \* 1.0 compulsory credit, 25.611
- \* 1.0 credit chosen from 25.612, 25.613, 25.614, 25.615
- \* 0.5 compulsory credit, 25.690
- \* 1.0 additional credit
- \* 2.0 comprehensive credits
- \* 4.5 dissertation credits

## Language Requirements

Upon graduation, each student is expected to be proficient in one language (preferably French) in addition to English. Additionally, students will be expected to deal with all material that is their primary object of research in its original language. The graduate supervisor should be consulted about the fulfillment of language requirements.

## Comprehensive Examinations

Students are required to pass two written comprehensive examinations. Each comprehensive has a 1.0 credit value:

1. The first comprehensive will be a general examination of the broad range of cultural theory of the twentieth-century;
2. The second comprehensive will be a discipline-specific examination from one of the following four areas of specialization chosen by the student: Literary Studies; Visual Culture; Musical Culture; New Technologies.

## Thesis

All students are required to complete a thesis in partial fulfillment of the requirements of the degree offered by the program. The thesis must be defended at an oral examination.

All students will be required to prepare, present and defend a thesis proposal before proceeding to the writing of the thesis. The proposal will be discussed and defended before the members of the thesis advisory committee at an oral defense chaired by the graduate supervisor.

The program appoints a doctoral thesis advisory committee, the chair of which shall be the student's thesis supervisor. The committee will consist of at least three members of the university faculty, at least two of whom will be core (or associate) faculty in the program. The advisory committee shall determine when a thesis may go forward for examination.

## Academic Standing

Doctoral students must normally obtain a grade of B- or better in each course counted toward the fulfillment of the requirements of the degree.

## Guidelines for Completion of the Doctor of Philosophy

Full-time Ph.D. students are expected to complete their requirements within six calendar years. Students who undertake the program by a combination of full-time and part-time study must complete their degree requirements within an elapsed period of eight calendar years, as set out in this Calendar under the General Regulations (see p.55)

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the Fall and Winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Cultural Mediations 25.611T2

### Perspectives on Interdisciplinarity in Cultural Theory

This course will address the theory and practice of interdisciplinary studies of culture. Attention will be paid to those issues in cultural theory of the twentieth-century that inform interdisciplinary work today in literature, film, music, art and new media.

Cultural Mediations 25.612F1,W1,S1

### Issues of Cultural Identity and Hybridity

This course will look at specific examples of Western and non-Western cultural practice that raise questions about the personal and social consequences of differential cultural relations. Emphasis will be less upon the discreteness of the cultural practices in question and more upon their heterogeneity and hybridization.

Cultural Mediations 25.613 F1,W1,S1

### Issues of Cultural Mediation and Representation

This course will examine how works from dif-

ferent cultures or works in the same or different media from the same culture pose questions about the nature of representation, interpretation, meaning and affect. Emphasis will be upon the relation between social intelligibility and textual features.

Cultural Mediations 25.614 F1,W1,S1

### Issues of Subjectivity and Difference

This course will concern itself with understanding the theory of the subject and its relations, with examples from specific cultural practices in literary studies, film, music, art, popular culture and new media.

Cultural Mediations 25.615 F1,W1,S1

### Issues in the Technologies of Culture

This course concerns the role that technology plays in changing models of literacy, visuality and aurality. The technologies of the cultures of print, vision and sound will be discussed through specific examples of cultural practices in various media.

Cultural Mediations 25.690 T1

### Interdisciplinary Research Methods

Students will be introduced to a range of methods of inquiry, procedures and practices across related disciplines, using both traditional and electronic research tools, as preparation for the doctoral dissertation, practices of academic publishing, conference presentations, and private and public sector writing and research protocols.

Cultural Mediations 25.691 F1,W1,S1

### Directed Readings in Cultural Mediations

This tutorial is designed to permit students to pursue research on topics chosen in consultation with members of faculty and the graduate supervisor.

Cultural Mediations 25.692 F1,W1,S1

### Special Topic in Cultural Mediations

This in-class course offers selected topics in interdisciplinary studies of culture not available in the regular course offerings.

Cultural Mediations 25.693 F1,W1,S1

### Special Topic in Cultural Mediations

This in-class course offers selected topics in interdisciplinary studies of culture not available in the regular course offerings.

Cultural Mediations 25.694 F1,W1,S1

### Special Topic in Cultural Mediations

This in-class course offers selected topics in interdisciplinary studies of culture not available in the regular course offerings.

Cultural Mediations 25.697 F2,W2,S2

### Comprehensive I

This comprehensive will be a general examination of the broad range of cultural theory of the twentieth-century as it informs interdisciplinary work today and the historical, intellectual and cultural frames of reference that this work invokes.

Cultural Mediations 25.698 F2,W2,S2

**Comprehensive II**

This comprehensive will be a discipline specific examination in a specialized area of study chosen by the student in consultation with the graduate supervisor. Students will choose from one of the following five comprehensive areas: Literary Studies; Visual Culture; Musical Culture; New Technologies.

Cultural Mediations 25.699 F,W,S

**Ph.D. Thesis**

**Master's Level Courses**

Students may take the equivalent of 1.0 credit at the Master's level.

**Other Programs**

Students may take the equivalent of 0.5 credit in a related program. Students should contact the supervisor of graduate studies for approval.

## Economics

Loeb Building C877  
Telephone: 520-3743  
Fax: 520-3906  
E-mail: economics@carleton.ca

### The Department

**Chair of the Department**, P.N. Rowe

**Supervisor of M.A. Studies**, F.R. Woolley

**Supervisor of Ph.D. Studies**, Z. Chen

**Director of Joint Doctoral Program with the University of Ottawa**, R.A. Devlin

The Department of Economics offers programs of study and research leading to the M.A. and Ph.D. degrees.

Graduate students in economics undertake a thorough review of economic theory, together with an analysis of the Canadian economy, its institutions and history, and the working of public policy. Stress is placed on the understanding and application of quantitative methods to all aspects of economics. Although the programs are generally oriented towards policy problems, there is considerable opportunity for the development of specialized interests.

The main areas of study within the Department include the following:

- \* Industrial Organization
- \* Public Economics
- \* Monetary Economics
- \* International Economics
- \* Economic Development
- \* Economics of the Environment
- \* Economic Theory
- \* Quantitative Methods

### Qualifying-Year Program

Applicants who have a general (3 year) bachelor's degree, or who otherwise lack the required undergraduate preparation, may be admitted to a qualifying-year program designed to raise their standing to honours status. If successful, they may be permitted to proceed to the master's program the following year.

Refer to the General Regulations section of this Calendar for details of the regulations governing the qualifying year.

## Master of Arts

### Admission Requirements

The normal requirement for admission to the master's program is a B.A. (Honours) (or the equivalent) in Economics, with at least high honours standing.

Applicants are expected to have had adequate preparation in microeconomic and macroeconomic theory, econometrics, and mathematics. This could be satisfied, for example, by the following four undergraduate courses: advanced microeconomic theory, advanced macroeconomic theory, econometrics, and mathematics for economists. Students with deficiencies in these requirements may have their program requirements extended accordingly.

The Department may require certain applicants to write the Graduate Record Examination Aptitude Test and the Advanced Test in Economics offered by the Educational Testing Service.

### Program Requirements

All master's students in economics must fulfill the following requirements:

*Economics*  
43.501, 43.502, 43.505

In addition, each candidate must select and complete one of the following:

\* Approved courses for 2.5 credits, 1.0 of which may be selected from among those offered in a related discipline, with approval of the Department, through the supervisor of M.A. Studies, or

\* A thesis equivalent to 1.5 credits and approved course(s) for 1.0 credit

All approved course(s) will normally be taken at the 500 level.

### Internship Placement

An Internship option is available to full-time students in the M.A. program who are eligible to work in Canada. Registration in the Internship option requires departmental permission and is also limited by availability of placements. Students may apply to the M.A. Supervisor for the Internship option after completing 43.501, 43.502 and 43.505 or after completing 3.0 credits.

Internship placements will locate students for at least one term in the public service, the private sector, or non-governmental organizations. Students will integrate theoretical and applied economic analysis in their work experience. During their work term, students are required to register in 43.598: Internship Placement, which is additional to the existing pro-

gram requirements. While taking 43.598, students are considered to be part-time, and may register for not more than 1.0 credit in total.

## Academic Standing

A grade of B- or better must normally be received in each credit counted towards the master's degree. With respect to the required core credits in the program, 43.501, 43.502 and 43.505, there will be no exceptions. A candidate may, with the recommendation of the Department and the approval of the Dean of the Faculty of Graduate Studies and Research, be allowed a grade of C+ in 1.0 credit.

## Guidelines for Completion of Master's Degree

Full-time master's students are expected to complete their requirements within two terms. Part-time students will take a minimum of five terms but must complete within an elapsed period of six calendar years, as set out in this Calendar under General Regulations (see p.64.)

## Doctor of Philosophy

The doctoral program is offered jointly by the Departments of Economics at Carleton University and the University of Ottawa.

The Ph.D. program stresses the application of economic theory to the analysis of Canadian economic policy and economic development. Six areas of specialization are available for intensive study and thesis research: public economics, industrial organization, monetary economics, international economics, economic development, and economics of the environment. The program of courses and thesis guidance, drawing upon the faculty of the two Departments, will encompass course requirements, policy-oriented workshops, comprehensive examinations, and a thesis. Students are expected to have, or to acquire, proficiency in mathematics and statistics before proceeding with the program.

In cases of exceptional merit, Ph.D. candidates may be accepted on a part-time basis.

## Admission Requirements

The normal requirement for admission into the Ph.D. program is a master's degree (or the equivalent) from a recognized university, with high honours standing. The Department may require certain applicants to write the Graduate Record Examination Aptitude Test and the Advanced Test in Economics offered by the Educational Testing Service.

## Transfer from Master's to Ph.D. Program

A student who shows outstanding academic performance, and who demonstrates high promise for advanced research during the master's program may, subject to meeting the requirements below, be permitted to transfer into the Ph.D. program without completing the M.A. program;

\* The student will have completed Economics 43.501, 43.502 and 43.505.

\* The student must make formal application to the graduate studies committee.

\* Students permitted to transfer into the Ph.D. program will be required to complete the equivalent of 13.5 credits of which 6.0 or 7.0 credits will be assigned to the Ph.D. Thesis, depending on the student's background and grades at the time of the transfer.

\* Students who have taken 43.600 and/or 43.601 as part of the M.A. curriculum will be granted advanced standing in these courses.

## Program Requirements

Students admitted to the joint Ph.D. program are required to complete 10.0 credits (unless additional course work is required), including 1.5 compulsory credits in 43.600 (ECO7922), 43.601 (ECO7923) and 43.571 (ECO7126; 7526).

Students are also required to do course work in two of six fields of specialization leading to field comprehensive exams and the writing of a thesis. To fulfill this requirement, students are expected to assimilate the material in 1.5 credits (or the equivalent) in each of two fields of specialization. However, the Department expects that a typical student entering the program with a completed M.A. will have taken the equivalent of 1.5 credits during his or her M.A. course work. If a student entering the program meets this expectation, the student is required to take only 1.5 credits (or the equivalent) over two fields of specialization. If the student's background is not consistent with this expectation, the admissions committee may require, as a condition of entry, that a student take up to 1.5 additional credits. Courses in the fields of specialization will be:

*Public Economics*  
43.541, 43.542, 43.543, 43.544

*Industrial Organization*  
43.531, 43.532, 43.533

*Monetary Economics*  
43.566, 43.567, 43.568, 43.569

*International Economics*  
43.561, 43.562, 43.563, 43.555

*Economic Development*  
43.550, 43.554, 43.555

*Economics of the Environment*  
43.535, 43.536, 43.557

## Comprehensive Examinations

Oral examinations are not compulsory, but a candidate may be required by the examining committee to sit an oral examination.

### \* Theory

Each student will register in 43.690 (ECO7990) and 43.691 (ECO7990), in order to write the comprehensive examinations in microeconomic and macroeconomic theory. These two examinations are to be written within twelve months of beginning full-time study.

### \* Fields

Students will be required to write comprehensive examinations in two fields.

## Thesis and Workshop Requirements

### Thesis

Doctoral students will write and defend a Ph.D. thesis. In preparing the thesis, the student is required to give two thesis workshops. In the first, a research proposal for the thesis will be presented, for evaluation by at least three faculty members. In the second, a substantial portion of the research for the thesis will have been completed and will be presented and evaluated as above. The workshops are requirements for graduation, and students will receive 1.0 credit for them.

### Workshops

Students are encouraged to attend and participate in the regular departmental workshops relevant to their fields of interest and research. Such workshops are conducted in six areas:

### \* Industrial Organization

### \* Public Economics

### \* International Economics

### \* Monetary Economics

### \* Economic Development

### \* Economics of the Environment

Further details about this joint Ph.D. program may be obtained by writing to the Director of Doctoral Studies, joint Ph.D. program in Economics, either at the Department of Economics, Carleton University, or at the Department of Economics/ Département de science économique, University of Ottawa.

## Academic Standing

Doctoral students must normally obtain a grade of B- or better in each credit counted towards the degree.

## Guidelines for Completion of Ph.D. Degree

Full-time Ph.D. students are expected to complete their requirements within four calendar years. Students who undertake the program by a combination of full-time and part-time study must complete their degree requirements within an elapsed period of eight calendar years, as set out in this Calendar under General Regulations.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

Enrolment in graduate courses requires the permission of the Department, through the supervisor of graduate studies.

Economics 43.501F1

### Microeconomic Theory I

An examination of the theories of the behaviour of individual economic agents: consumers and producers and their relation to the theories of price determination.

Economics 43.502F1

### Macroeconomic Theory I

Macroeconomic theory and its implications for economic policy are surveyed in this course, comparing alternative approaches for a variety of topics.

Economics 43.503W1

### Microeconomic Theory II

A continuation of Microeconomic Theory I.

Economics 43.504S1

### Macroeconomic Theory II

A continuation of Macroeconomic Theory I.

Economics 43.505F1

### Econometrics I

Estimation and testing of the general linear model, with emphasis on problems such as auto-correlation, heteroscedasticity, multicollinearity, and problems due to distributed lags and errors in variables. Introduction to simultaneous equations systems, identification, and estimation.

Economics 43.507F1, W1, S1

### Directed Readings

Prerequisite: Permission of the Department.

Economics 43.508F1, W1, S1

**Special Topics**

Prerequisite: Permission of the Department.

Economics 43.509F1, W1, S1

**Directed Research**

At least one paper will be required from a student enrolled in any one of these courses.

Prerequisite: Permission of the Department.

Economics 43.511F1

**Canadian Economy I**

An examination of aspects and problems of the Canadian economy. Topics may include the economic development of Canada, regional development, industrial organization, factor market, income distribution, international trade and capital flows, and macroeconomic stability.

Economics 43.512W1

**Canadian Economy II**

Economic theory applied to the workings of the Canadian economy. Empirical estimation of various aspects of factor market operation, production, distribution, and aggregate economy. Participants are expected to prepare and present papers for discussion.

Economics 43.521F1

**History of Economic Thought I**

The crucial achievements in economic theory and doctrine in the nineteenth and twentieth centuries are studied. Special emphasis is given to the interrelationship between the social environment and economic thought - especially to the role of economics in the development of the national state and international institutions. Also offered at the undergraduate level, with different requirements, as part of Economics 43.415, for which additional credit is precluded.

Economics 43.522W1

**History of Economic Thought II**

A continuation of 43.521. Also offered at the undergraduate level, with different requirements, as part of Economics 43.415, for which additional credit is precluded.

Prerequisite: Economics 43.521 or permission of the Department.

Economics 43.525F1 (ECO7125; 7525)

**Mathematical Economics**

General equilibrium; dynamic optimization; game-theory.

Economics 43.531F1 (ECO6140; 6540)

**Firms and Markets**

An examination of theories pertaining to industrial organization, and their application to particular industries in Canada and elsewhere by way of empirical studies.

Economics 43.532W1 (ECO6141; 6541)

**Competition Policy**

An examination of the rationale and application of competition policy with particular attention to the Canadian economy.

Economics 43.533S1 (ECO6142; 6542)

**Regulation and Public Enterprise**

An examination of regulation and public enterprise as alternative approaches for influencing industry conduct and performance.

Economics 43.535F1 (ECO6143; 6543)

**Economics of Natural Resources**

Dynamic optimization; theory of renewable and non-renewable natural resources, including the environment; policy options for correcting market failures.

Economics 43.536F1, W1 (ECO6151; 6551)

**Economics of the Environment**

The environment as natural capital; environmental valuation techniques; elements of environmental income accounting; sustainable development theories and practice; institutional questions and policy issues.

Prerequisite: Economics 43.535.

Economics 43.537F1, W1

**Labour Economics**

The application of price theory to the labour market. Topics include models of labour supply and labour demand, human capital and the economics of education and unions and their impact on the labour market. Also offered at the undergraduate level, with different requirements, as Economics 43.436★, for which additional credit is precluded.

Economics 43.538W1

**Law and Economics**

The interrelationship of law and economics, emphasizing transaction costs and property rights. Economic analysis of such topics as the allocative effects of alternative property rights, contract, tort, and nuisance law and the economics of crime, pollution, pay television, and eminent domain.

Economics 43.539W1

**Applied Industrial Economics**

The application of industrial economics, with special emphasis on Canada and the rest of North America. Topics include the structure of consumer demand, firm production and investment, industrial structure and international trade, and the effect of government policies on industrial development.

Economics 43.541F1 (ECO6130; 6530)

**Public Economics: Expenditure**

A discussion of the role of government expenditure, both in theory and with reference to the Canadian economy.

Economics 43.542W1 (ECO6131; 6531)

**Public Economics: Taxation**

An analysis of the effects of various forms of taxation on economic performance.

Economics 43.543W1 (ECO6133; 6533)

### **Public Choice**

Democracy, bureaucracy, and economic policy. The public choice of fiscal constitutions, tax shares, and equity rules; voting coalitions and income distribution; the public provision of private goods; public sector size, fiscal illusion, and taxpayer revolts.

Economics 43.544W1 (ECO6132; 6532)

### **Fiscal Federalism**

This course examines the economic aspects of federalism, including efficiency, redistribution, consideration of a federal system of government, intergovernmental grants, and problems of stabilization policy in a federal context.

Economics 43.545W1

### **Theoretical Welfare Economics**

A rigorous treatment of the theoretical foundations of welfare economics.

Economics 43.547W1

### **Project Evaluation**

An analytical treatment of the principles of project evaluation and their applications. Also offered at the undergraduate level, with different requirements, as Economics 43.447★, for which additional credit is precluded.

Economics 43.550F1 (ECO6170; 6570)

### **Theory of Economic Development**

This course will deal with theoretical approaches in the economic development literature in relation to the historical, economic, environmental, social, and political dimensions of the development process.

Economics 43.553W1

### **Stabilization Policy**

An examination of policies aimed at achieving internal and external stability. The implications of economic growth for stabilization policies will be discussed.

Prerequisite: Economics 43.502.

Economics 43.554W1 (ECO6171; 6571)

### **Economic Development: Internal Aspects**

An analysis of major domestic problems of economic development. Topics may include employment, income distribution, choice of technology, sectoral allocation of resources, human resource development, and domestic environmental issues.

Economics 43.555F1 (ECO6172; 6572)

### **Economic Development: International Aspects**

An analysis of key problems of international economic development such as trade in primary commodities and manufactures, financial flows and debt, the role of multinational corporations, the transfer of technology, and the international dimensions of environmental issues as they relate to the developing countries.

Economics 43.557W1 (ECO6173; 6573)

### **Environmental Aspects of Economic Development**

Policy aspects of sustainable economic development and environmental quality in developing countries. Topics to include energy use, deforestation, drought and desertification, depletion of natural resources, debt, environment and poverty, sustainable industrial and agricultural development, conservation policies, pollution control and global environmental issues.

Economics 43.561F1 (ECO6160; 6560)

### **International Trade: Theory and Policy**

International trade theory and its implications for economic policy are examined, with emphasis on topics such as determinants of trade and specialization, gains from trade and commercial policy, international factor mobility, growth, and development.

Economics 43.562W1 (ECO6161; 6561)

### **International Monetary Theory and Policy**

International monetary theory and policy, with emphasis on topics such as sources of equilibrium and disequilibrium in the balance of payments, balance-of-payments adjustment under fixed versus flexible exchange rates, international capital movements, and recent issues in the international monetary system.

Economics 43.563W1 (ECO6162; 6562)

### **Topics in International Economics**

An examination of key topics in international economics, including theoretical analysis, quantitative methods and policy formulation, implementation, and evaluation.

Prerequisite: Economics 43.561 or 43.562.

Economics 43.566F1 (ECO6180; 6580)

### **Microeconomic Aspects of Monetary Theory**

Microeconomic foundations of monetary theory. Alternative theories for the existence of money. Commodity, private and fiat money systems. The integration of monetary theory with the theory of value.

Economics 43.567W1 (ECO6181; 6581)

### **Macroeconomic Aspects of Monetary Theory**

A course in monetary theory that deals with the macroeconomic interactions of money. Issues will include such topics as: inflation, money and wealth; the optimum quantity of money; the welfare aspects of monetary economies; the supply of money and its composition; stabilization policy; money, capital, and growth.

Economics 43.568F1 (ECO6182; 6582)

### **Aspects of Financial Intermediation**

The evolution of the financial system with special emphasis on the theory of financial institutions and its interrelationship with the money supply process and the central bank. Contem-

porary monetary and finance theory applied to institutional problems in both historical and contemporary settings.

Economics 43.569W1 (ECO6183; 6583)

### **Explorations in Monetary Economics**

A course in which explorations in theory, policy recommendations, and empirical study are undertaken. The material challenges traditional approaches by examining such topics as the endogeneity of money, the role of credit, the finance motive, the circuit approach, flow of funds analysis, and austerity policies.

Economics 43.571F1 (ECO7126; 7526)

### **Econometrics II**

Selected topics from estimating and testing the regression and simultaneous equation models. Topics include maximum likelihood estimation, statistical analysis of residuals, autoregressive and other time-series models, multivariate regression model, and elements of asymptotic statistical theory within the context of the simultaneous equation model.

Prerequisite: Economics 43.505 or equivalent.

Economics 43.572W1

### **Applied Econometrics**

A discussion of the major problems encountered in applying the tools and techniques of econometric methods to statistical data for economic analysis and forecasting. Selected papers from the applied econometric literature are critically analyzed and appraised with the application of modern econometric techniques.

Prerequisite: Economics 43.505 or the equivalent.

Economics 43.573W1

### **Applied Time Series Analysis**

Introduces the basic concepts of time series analysis with emphasis on models used in economics. Topics include stationary and nonstationary time series, model identification and estimation, transfer functions, and forecast computation. Also offered at the undergraduate level, with different requirements, as Economics 43.483★, for which additional credit is precluded.

Economics 43.581F1

### **Regional Economics**

Regional economic disparities in Canada, theories and public policy relating thereto. Consideration will be given to the concept of regions, location of industry and industrial structure, and to growth determinants.

Economics 43.582W1

### **Urban Economics**

An examination of the economic properties of urban areas. Attention will be focused on the macrodynamics of urban development, together with the microstatics of the equilibrium properties of the urban land market.

Economics 43.586F1

### **Comparative Economic Systems I**

This course builds a framework for comparing economic systems, and also considers the interaction between economic and political systems. The traditional Soviet-type economy, industrial policy, and problems of transition receive particular attention. Also offered at the undergraduate level, with different requirements, as Economics 43.486★, for which additional credit is precluded.

Economics 43.587W1

### **Comparative Economic Systems II**

A comparison of contemporary economic systems. Such diverse economies as mainland China, Japan, Germany, Sweden, Russia, Taiwan, and Hungary may be explored. Also offered at the undergraduate level, with different requirements, as Economics 43.487★, for which additional credit is precluded.

Economics 43.592

### **Internship Placement**

Internship students are required to register in this course during their work term.

Prerequisite: Permission of the Department.

Economics 43.593F1

### **Mathematical Methods for Economists**

A rigorous review of mathematical techniques in economics, such as: matrix algebra, static optimization, nonlinear programming, and difference and differential equations. It introduces the theory of optimal control, dynamic programming, and real analysis. Applications of these tools to various parts of economic theory are presented.

Economics 43.599F3, W3, S3

### **M.A. Thesis**

Economics 43.600W1 (ECO7922)

### **Economic Theory: Microeconomics**

An examination of critical aspects of microeconomic theory drawn from recent analysis of consumer behaviour, costs and production, transaction costs, uncertainty, and the organization of economic activity.

Prerequisite: Economics 43.501 or equivalent.

Economics 43.601W1 (ECO7923)

### **Economic Theory: Macroeconomics**

An examination of critical aspects of macroeconomic theory drawn from recent analysis of the microeconomic foundations of macroeconomics, concepts of macroeconomic equilibrium and the impact of monetary and fiscal disturbances. Attention is also directed to a variety of topics related to the conduct of macroeconomic policy.

Prerequisite: Economics 43.502 or equivalent.

Economics 43.611F1, W1, S1 (ECO7002; 7004)

### **Thesis Workshop**

See Thesis and Workshop Requirements.

Economics 43.670F1, W1, S1 (ECO7980)

**Directed Readings**

Prerequisite: Permission of the Department.

Economics 43.690W1, S1 (ECO7990)

**Comprehensive Examination in Microeconomic Theory**

See Comprehensive Examinations.

Economics 43.691W1, S1 (ECO7990)

**Comprehensive Examination in Macroeconomic Theory**

See Comprehensive Examinations

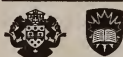
Economics 43.699F10, W10, S10 (ECO9999)

**Ph.D. Thesis**

# Ottawa-Carleton Institute for Electrical and Computer Engineering

Minto Centre 3091  
1125 Colonel By Drive  
Telephone: (613) 520-5659  
Fax: (613) 520-5682

Université d'Ottawa  
University of Ottawa



Carleton University

## The Institute

**Director of the Institute, Barry Syrett**

Established in 1983, the Institute combines the research strengths and resources of the Departments of Electronics and of Systems and Computer Engineering at Carleton University and the Department of Electrical Engineering at the University of Ottawa. Programs leading to master's and Ph.D. degrees are available through the Institute in a wide range of fields of electrical engineering. Graduate students may pursue their research on either university campus, depending upon the choice of supervisor.

Registration will be at the university most appropriate to the student's program of studies and research.

Requests for information and applications for admission should be sent to the Director of the Institute.

## Members of the Institute

The home department of each member is indicated by (SITE) for the School of Information Technology and Engineering, University of Ottawa; (CE) for the Department of Electronics, Carleton University; (SCE) for the Department of Systems and Computer Engineering, Carleton University.

- A. Aboulnasr, *Digital Signal Processing, Applications in Communications* (SITE)
- S. Abu-Hakima, *Multimedia Applications in Telecommunications, Applications for Artificial Intelligence in Telecommunications* (SCE-Adjunct)
- R. Achar, *Computer-Aided Engineering, Simulation and Optimization* (CE)
- N.U. Ahmed, *Systems Theory, Optimal Control, Filtering and Identification with Applications to Spacecraft, Optical Networks and Artificial Hearts* (SITE)
- V. Aitken, *Distributed Processes, Process Control* (SCE)
- S. Aly, *Signal Processing, Digital Transmission* (SCE)
- A. Banihashemi, *Digital and Wireless Communications, Coding and Information Theory* (SCE)
- C. Barrière, *Natural Language Processing, Knowledge Representation, Knowledge Acquisition from Text* (SITE)
- P. Berini, *Electromagnetics, Numerical Modelling, Guided-Wave Optics, Optoelectronics, Optical Communications, Microwaves, Non-linear Microwave Circuits* (SITE)
- A. Bieszczad, *Mobile Agents, Knowledge Engineering* (SCE)
- G. von Bochmann, *Communication Protocols, Software Engineering, Formal Specifications, Verification and Validation, Distributed Applications and Systems Management, Multimedia, High-Speed Networks, Real-time Systems* (SITE)
- A.R. Boothroyd, *Solid State Devices, ICs, CAD* (CE -Professor Emeritus)
- M. Bouchard, *Signal Processing, Adaptive Filtering, Neural Networks and Control, Applied to Speech, Acoustics and Audio* (SITE)
- L. Briand, *Software Reliability and Certification* (SCE)
- R.J.A. Buhr, *Software Design, Real-Time and Distributed Systems, Object-Oriented Design* (SCE)
- R.J.C. Bultitude, *Digital Radio, Propagation, Mobile and Portable Radio Systems* (SCE-Adjunct)
- J.W. Chinneck, *Computer Modelling, Operations Research, Applied Optimization* (SCE-Adjunct)
- R.J.C. Bultitude, *Digital Radio, Propagation, Mobile and Portable Radio Systems* (SCE -Adjunct)
- C.J. Butz, *Artificial Intelligence, Database Systems* (SITE)
- C.H. Chan, *VLSI Circuits, Systems* (CE)
- C. Charalambous, *Theory and Applications of Stochastic Processes, Wireless Communication Networks, Information Theory, Data Fusion in Computer Networks, Robust Control, Mathematical Finance, Large Deviations* (SITE)
- S. Charbonneau, *Photonics* (CE-Adjunct)
- J.W. Chinneck, *Computer Modelling, Operations Research, Applied Optimization* (SCE)
- J.-Y. Chouinard, *Mobile Communications, Wireless and Mobile Communications, Modulation and Coding, Cryptography* (SITE)
- Jacek Chrostowski, *Photonics, Sensors* (SITE)

Adjunct)

- D.C. Coll, *Telecommunications and Computers, Image Processing* (SCE - Professor Emeritus)
- M.A. Copeland, *ICs, Analog Signal Processing, CAD, Digital Radio* (CE -Professor Emeritus)
- G.I. Costache, *Electromagnetic Interference and Compatibility* (SITE)
- C. D'Amours, *Digital Communications, Modulation and Coding Techniques* (SITE)
- S.R. Das, *Digital Circuits, Fault-Tolerant Computing* (SITE)
- F. Danilo-Lemoine, *Telecommunications and Statistical Signal Processing* (SCE)
- M. Devetsikiotis, *Modelling and Simulation, Computer Networks, Applied Optimization* (SCE - Adjunct)
- E. Dubois, *Digital Signal Processing, Multidimensional Signal Processing, Data Compression, Source Coding, Image/video Processing and Coding* (SITE)
- S. El-Hennawy, *Communications* (SCE - Adjunct)
- M.S. El-Tanany, *Mobile and Portable Communications, Digital Signal Processing, Synchronization* (SCE)
- B. Esfandiari, *Software Engineering* (SCE)
- D.D. Falconer, *Digital Communications, Signal Processing, Mobile and Portable Digital Communications* (SCE)
- M. Frize, *Biomedical Instrumentation, Clinical Engineering, Infra-Red Imaging, Decision-Support Systems in Medicine, Ethics in Engineering and Human Experimentation* (SITE and SCE)
- P.A. Galko, *Digital Communications, Optical Communications* (SITE)
- J. Genest, *Software Engineering* (SITE)
- N.D. Georganas, *Multimedia Communications, Computer Communications*(SITE)
- D.T. Gibbons, *Digital and Biomedical Electronics, Computer Engineering* (SITE)
- R.A. Goubran, *Audio Signal Processing, Digital Systems Design, Adaptive Systems* (SCE)
- V. Groza, *Computer Engineering, Real-Time Embedded Systems, Distributed Applications and Virtual Instrumentation* (SITE)
- R.H.M. Hafez, *Wireless Communications, Neural Networks* (SCE)
- R.G. Harrison, *Microwaves, Non-linear Processes* (CE - Adjunct)
- B. Hashem, *Communications* (SCE - Adjunct)
- C. Huang, *High-Speed Multimedia Networks* (SCE)
- J. Huang, *ATM Traffic Management* (SCE - Adjunct)
- R. Impey, *Network Computing* (SCE - Adjunct)
- D. I.-A. Ionescu, *Computers, Artificial Intelligence, Image Processing, Discrete Event and Real-Time Systems* (SITE)
- N. Japowicz, *Artificial Intelligence, Machine Learning, Natural Language Processing* (SITE)
- P. Jay, *Communications Technology* (SITE - Adjunct)
- S. Janz, *Silicon Optoelectronics* (CE - Adjunct)
- F. Johnson, *Orthopedic Biomechanics, Medical Signalling Processing, Biomedical Engineering* (SITE)
- G.M. Karam, *Telecommunications, Software, Analysis and Design of Concurrent Systems and Real Time Systems* (SCE - Adjunct)
- Ahmed Karmouch, *Multimedia Communications, Multimedia Real-Time Distributed Information Systems and Databases* (SITE)
- J.P. Knight, *Logic Design, Computer-Aided IC Design, VLSI Testing* (CE)
- T. Kunz, *Parallel and Distributed Systems* (SCE)
- T.A. Kwasniewski, *Digital and Analog Signal Processing, Microprocessors* (CE)
- Y. Labiche, *Software Engineering, Testing and Object Oriented Techniques* (SCE)
- R. Laganière, *Computer Vision, Image Processing* (SITE)
- Ioannis Lambadaris, *Computer Networks* (SCE)
- B. Lamongtagne, *InP Optoelectronics* (CE-Adjunct)
- T. Lethbridge, *Human Computer Interaction, User Interfaces, Software Engineering Tools and Work Practices, Software Reverse Engineering, Knowledge Representation* (SITE)
- L. MacEachern, *VLSI, Analog IC Design* (CE)
- S.A. Mahmoud, *Distributed Databases, Radio Packet Switching, Communication Network Protocols* (SCE)
- Shikarish Majumdar, *Parallel and Distributed Systems, Operating Systems, Performance Evaluation* (SCE)
- D. J. Makaroff, *Multimedia Systems and Servers, Distributed Systems, Network Protocols* (SITE)

- D. Makrakis, *Computer Networks: Architectures, Protocols, Management, Broadband Applications* (SITE)
- M. Marchand, *Machine Learning, Neural Networks, Pattern Recognition* (SITE)
- I. Marsland, *Mobile and Portable Radio Systems* (SCE)
- R. Mason, *VLSI, Analog IC Design* (CE)
- S. Matwin, *Artificial Intelligence, Knowledge-Based Systems, Machine Learning, Software Reuse* (SITE)
- S.P. McAlister, *Semiconductor Devices, IC Fabrication* (CE-Adjunct)
- C. McDonald, *Applied Probability in Telecommunications* (SITE)
- D. McNamara, *Antennas, Electromagnetics, Numerical Modelling, Microwaves* (SITE)
- L.R. Morris, *DSP, Microcomputers, Speech and Image Processing, Computer Architecture* (SCE-Adjunct)
- H.T. Mouftah, *Computer Communications* (SITE -Adjunct)
- L. Moura, *Combinatorial Algorithms* (SITE)
- T. Mussivand, *Medical Devices, Biomedical Engineering, Biotelemetry, Telemedicine, Artificial Hearts, Virtual Patient Simulation* (SITE)
- M.S. Nakhla, *Computer-Aided Engineering, Simulation and Optimization* (CE)
- L. Orozco-Barbosa, *Computer Architecture, Communication Networks and Performance Evaluation* (SITE)
- Bernard Pagurek, *Network Fault Management, Artificial Intelligence, Diagnosis* (SCE)
- F.C. Palmer, *Mobile Communications, Broadcast Systems, Channel Characterization, Propagation Modelling* (CE-Adjunct)
- Sethuraman Panchanathan, *Computer Engineering, Video Compression, Image Processing, Parallel Processing* (SITE-Adjunct)
- E. Parsons, *Parallel and Distributed Systems* (SCE-Adjunct)
- P. Payeur, *3D Modelling for Robotics, Computer Vision, Autonomous Systems* (SITE)
- T. Pearce, *Real-Time Systems, Embedded Systems, Software Engineering* (SCE)
- A. Petosa, *Antennas* (CE-Adjunct)
- S. Periyalwar, *Wireless Communications* (SCE-Adjunct)
- D.C. Petriu, *Performance Evaluation, Software Engineering, Database Systems* (SCE)
- E.M. Petriu, *Robotics, Sensing and Perception, Neural Networks* (SITE)
- Calvin Plett, *Analog I.C. Design* (CE)
- P. Poole, *InP Optoelectronics* (CE-Adjunct)
- J.-F. Rivest, *Image Processing, Image Coding, Pattern Recognition* (SITE-Adjunct)
- J.A. Rolia, *Distributed Applications and Interoperable Systems, Performance Management, Software Performance Engineering* (SCE-Adjunct)
- D. Rossille, *Digital Signal Processing Applied to Astronomy and Telecommunication* (SCE)
- Langis Roy, *Microwave Electronics, Integrated Antennas, Electromagnetic Modelling* (CE)
- J. Ryan, *Signal Processing* (SCE-Adjunct)
- H.M. Schwartz, *Robotics, Controls* (SCE)
- M. Shams, *VLSI Circuits and Systems* (CE)
- T.J. Smy, *Semiconductor Devices and Transducers, IC Technology* (CE)
- L. Strawczynski, *Wireless Communications* (SCE-Adjunct)
- P.C. Strickland, *Antennas, Microwaves* (CE - Adjunct)
- M.G. Stubbs, *Microwave Integrated Circuits* (CE - Adjunct)
- B.A. Syrett, *Microwave Integrated Circuits, Optical Interconnects* (CE)
- Valek Szwarc, *Signal Processing for Communications* (CE - Adjunct)
- N. Tait, *MEMS, Sensors, IC /fabrication* (CE)
- N.G. Tarr, *Solid State Devices, IC Fabrication* (CE)
- R.E. Thomas, *Solid State Technology, Solar Energy* (CE - Adjunct)
- M. Turcotte, *Bioinformatics, Algorithm Design, Applications of Machine Learning* (SITE)
- G. Wainer, *Discrete Event Simulation, Modelling and Simulation Methodologies, Parallel and Distributed Simulation, Real-Time Systems* (SCE)
- D.J. Walkey, *Simulation and Modelling of Submicron MOS and Bipolar VLSI Devices* (CE)
- C.R. Walker, *Neonatal Medicine* (SCE-Adjunct)
- L. Wang, *Communication and Image Processing* (SITE-Adjunct)
- T. White, *Swarm Intelligence, Genetic Algorithms* (SCE-Adjunct)
- J.S. Wight, *Radar, Spread Spectrum and Navigation Systems, Microwave Circuits, Antennas, Synchronizers, Phase-Locked Circuits* (CE)

- C.M. Woodside, *Software Engineering and Performance, Distributed System Modelling and Design* (SCE)
- Y.Wu, *Communications, Video Compression and Transmission* (SCE-Adjunct)
- J. Yan, *Performance and Evaluation of Networks* (SCE-Adjunct)
- O.W. Yang, *Computer Communications, Broadband Networks, Performance Evaluation, Network Interconnection, Queuing Theory* (SITE)
- H. Yanikomeroglu, *Wireless and Mobile Communications, Spread Spectrum Systems* (SCE)
- T.Yeap, *Neural Networks, Parallel Computer Architectures, VLSI, Digital Systems and Control* (SITE)
- G. Yee, *Parallel and Distributed Systems* (SCE-Adjunct)
- Abbas Yongacoglu, *Digital Communications Coding and Modulation, Spread Spectrum Systems* (SITE)
- Q.J. Zhang, *CAD for VLSI, Optimization* (CE)

## Master's Degree

### Admission Requirements

The normal requirement for admission to a master's program is a bachelor's degree with at least high honours standing in electrical engineering or a related discipline.

### Program Requirements

The requirements for course work are specified in terms of credits: one credit = one hour/week for one term. Subject to the approval of the departmental chair, a student may take up to half of the course credits in the program in other disciplines (e.g., Mathematics, Computer Science, Physics). At the University of Ottawa, master's programs with a thesis earn the Master of Applied Science degree, while other master's programs earn the Master of Engineering degree. At Carleton University, all master's programs earn the Master of Engineering degree.

#### *Master's Degree by Thesis*

- \* Eighteen course credits plus thesis

#### *Master's Degree by Course Work*

- \* Twenty-seven course credits plus a project (nominally six credits)

#### *Cooperative Master's Degree by Thesis*

- \* Eighteen course credits plus a thesis

#### *Cooperative Master's Degree by Course Work*

- \* Twenty-four course credits plus two projects (each conducted in one work term)

Participation in the cooperative master's program is subject to acceptance by a suitable sponsoring organization.

## Doctor of Philosophy

### Admission Requirements

The normal requirement for admission into the Ph.D. program is a master's degree with thesis in electrical engineering or a related discipline.

### Program Requirements

The requirements for course work are specified in terms of credits: one credit = one hour/week for one term. Subject to the approval of the advisory committee, a student may take up to half of the course credits in the program in other disciplines (e.g., Mathematics, Computer Science, Physics).

- \* A minimum of nine course credits

\* A comprehensive examination involving written and oral examinations and a written thesis proposal, to take place before the end of the fourth term of registration

- \* A thesis which must be defended at an oral examination

## Graduate Courses

In all programs, the student may choose graduate courses from either university with the approval of the adviser or advisory committee. Course descriptions may be found in the departmental section of the calendar. All courses are of one term duration. Only a selection of courses listed is given in a particular academic year. The following codes identify the department offering the course.

#### *Carleton University*

94 Department of Systems and Computer Engineering

97 Department of Electronics

#### *University of Ottawa*

92 Department of Electrical Engineering

The CSI designation refers to the Department of Computer Science at the University of Ottawa. The ELG designation refers to the Department of Electrical Engineering at the University of Ottawa.

## Electronics

Mackenzie Building 5170

Telephone: 520-5754

Fax: 520-5708

E-mail: gradinfo@doe.carleton.ca

### The Department

**Acting Chair of the Department, N.G. Tarr**

**Associate Chair, Graduate Studies, D.J. Walkey**

**In addition to University and Graduate Faculty regulations, all Engineering departments share common procedures that are described in Section 18 of the General Regulations (see p. 69).**

Programs of study and research leading to the master's and Ph.D. degrees in electrical engineering are offered through the Ottawa-Carleton Institute for Electrical and Computer Engineering. The Institute, established in 1983, combines the resources of Carleton University and the University of Ottawa. For further information, including admission and program requirements, see p.158.

The Department of Electronics is concerned with the fields of applied and physical electronics. Effort is strongest in four broad areas: computer-aided design for electronic circuits; physics and fabrication technology for solid-state electronic and photonic devices; VLSI and high-speed analog integrated circuits; and microwave and photonic subsystems and circuits. Specific areas of specialization include:

#### *Computer-Aided Circuit Design*

Development of hierarchical simulators for mixed analog/digital circuits; analysis and design of switched-capacitor networks; analysis and design of high speed circuits; optimization techniques; synthesis of VLSI circuits using both algorithmic and knowledge-based approaches; analysis and simulations of communications systems links; layout synthesis and module generation.

#### *Photonic Devices*

Waveguides and holographic optical elements for optical interconnects; electro-optic modulators and switches; waveguides for sensing applications.

#### *Solid State Devices*

Fundamental semiconductor device physics; device design and novel device structures; device modelling for CAD; new fabrication processes; submicron and quantum effect devices; photovoltaics; semiconductor sensors and transducers.

#### *Integrated Circuit Engineering*

Design and development of linear and digital integrated circuits; fabrication processes and

test techniques; MOS, bipolar and BiCMOS ICs; VLSI; computer-aided circuit design.

#### *Analog Signal Processing*

Switched-capacitor filters, transversal filters, operational amplifiers and radio frequency functions in analog signal processing applications, particularly for integrated circuit realization.

#### *Circuits*

Active filters; linear and nonlinear circuit design; computer-aided circuit design; phase-locked circuits, carriers and clock synchronizers; mixers, modulators and demodulators.

#### *Microwave Electronics*

Microwave amplifiers, oscillators, modulators, frequency converters, phase-shifters; use of FET and bipolar transistors, Schottky barrier, varactor, step recovery and PIN diodes; design using finline, microstrip, stripline, coax, and waveguide; monolithic microwave ICs in GaAs; miniature hybrid microwave ICs.

#### *Communications and Radar Electronics*

Circuits for terrestrial and satellite communications; circuit implementation of digital modulation techniques; antenna and array design; communication channel characterization; optical communications circuits; radar transmitter and receiver design.

#### *Biomedical Electronics*

Cochlear prosthesis.

### NSERC/BNR Chair in CAD

The joint Natural Sciences and Engineering Research Council/Bell Northern Research Chairs in Computer-Aided Design are currently held by Dr. Michel Nakhla and Dr. Q.J. Zhang. This is part of a planned expansion of the department in the area of CAD for VLSI.

### CITO

The Department is part of the CITO (Communications and Information Technology of Ontario) Centre of Excellence. Current research areas of the Centre with major participation from the Department are: integrated services digital networks, mobile and portable wireless networks, VLSI in communications, and millimetre wave/optical antennas and circuits for personal communications.

### Micronet

The Department is a member, along with seven other Canadian universities and several major industrial organizations, of Micronet, the federally-sponsored network on Microelectronic Devices, Circuits and Systems for ULSI (ultra-large scale integration). Within the Department Micronet supports research on: device structures, modelling and fabrication processes and

submicron CMOS and BiCMOS ICs; high-speed filters, phase detectors, A-to-D converters, frequency synthesizers and other circuit elements for silicon ICs operating at radio frequencies; analysis and optimization of interconnects for high-speed ICs; and automated generation of custom cells for VLSI design.

## Course Offerings

The structure of the courses offered allows a well-integrated master's or Ph.D. program of study to be chosen that is appropriately related to the field of thesis research. Device- and integrated-circuit-oriented courses cover: fabrication, semiconductor device theory, semiconductor device design, integrated circuit design, and integrated circuit reliability. Circuit-oriented courses include: signal-processing electronics, micro-processor electronics, computer-aided circuit design, phase-locked circuits, filter circuits, RF and microwave circuits, antenna and array design. Systems-oriented courses cover: optical fibre communications and radar systems.

## IC Fabrication Facilities

Excellent facilities are available for the fabrication of solid state devices and integrated circuits for research purposes. These include a class-100 clean room in which all basic processes required in silicon monolithic technology can be carried out. The clean room houses facilities for photomask generation and photolithography, modern diffusion furnaces, a rapid thermal annealer, low-pressure chemical vapour deposition systems, ECR and reactive ion etchers, e-beam, RF and magnetron sputtering systems for metal deposition, and a SEM. Equipment for thick film deposition, scribing, bonding, and automatic testing is also available. Comprehensive test facilities are available for IC characterization, including wafer probers, HP4145 Semiconductor Parameter Analyzers, and an automated C-V measurement station.

## Computing Facilities

The Department has excellent computing facilities for software development and circuit design for integrated circuits and microwave circuits. IC designs using synthesis, standard cells and layout are supported for fabrication through the Canadian Microelectronics Corporation or in-house.

The graduate computer network consists of 90 SUN workstations and has access to the Internet. Industry standard software includes CADENCE, Mentor Graphics, SYNOPSIS, HSpice, ANACAD, VARLOG, SONNET, EESOF, SUPREM, SEDAN, MEDICI, MINIMOS, Franz COMMON Lisp, MATLAB, MATHEMATICA, FRAMEMAKER, and others.

## Measurement Facilities

Advanced instrumentation is available supporting automated testing of both analog and digital integrated circuits at frequencies up to 2 GHz. Low noise test facilities include a phase noise measurement system, dynamic signal analyzers, spectrum analyzers, network analyzers, arbitrary waveform generators, digital sampling oscilloscopes, digital data analyzers and generators, and RF frequency synthesizers, all of which may be controlled using the IEEE 488 interface.

The Department has up-to-date facilities for circuit development and measurement at microwave frequencies ranging up to 22 GHz. There are also facilities for work at optical frequencies. Thin-film microwave integrated circuits can be fabricated in-house; there is provision for the fabrication of GaAs MMICs through foundry services. Special purpose microwave equipment includes automated network analyzers, spectrum analyzers and frequency synthesizers, and a complete microwave link analyzer. Data generators and error-detection equipment is available for work on digital communications. Industry standard software, such as SERENADE SUPERCOMPACT, HARMONICA and ACADEMY (TOUCHSTONE, LIBRA) is available for the computer-aided design and layout of microwave integrated circuits.

The research laboratories maintain extensive collaboration with government and industrial research and development agencies in the Ottawa area.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

The courses offered by the Department of Electronics are as follows:

Engineering 97.551F1 (ELG6351)

### Passive Microwave Circuits

Characteristics of homogeneous and inhomogeneous transmission lines and waveguides. Planar transmission lines: stripline, microstrip, coplanar line, slotline. Coupled transmission lines. Modelling of discontinuities. Ferrite components. Microwave network analysis: s-parameters, CAD models. Design of imped-

ance-matching networks, directional couplers, power splitters, filters. Applications in MICs and MMICs.

Engineering 97.552F1 or W1 (ELG6352)

### **Analog Integrated Filters**

The fundamentals and details of analog continuous-time and SAW filters. Comparison to switched-capacitor filters. Review of filter concepts, types of filters, approximations, transformations. Building blocks such as op amps, transconductance amplifiers, and gyrators. Design using cascaded second-order sections, multiple loop feedback and LC ladder simulations.

Engineering 97.553 (ELG6353)

### **Radio Frequency Integrated Circuit Design**

Integrated radio front-end component design. Overview of radio systems, frequency response, gain, noise, linearity, intermodulation, image rejection, impedance matching, stability, and power dissipation. Detailed design of low-noise amplifiers, mixers, oscillators and power amplifiers. Use of on-chip inductors and baluns. Process variations, parasitics, and packaging.

Engineering 97.554F1 or W1 (ELG6354)

### **Analysis of High-Speed Electronic Packages and Interconnects**

Introduction to modelling, simulation and optimization of high-speed VLSI packages; models for packages, interconnects and ground/power planes; lumped, distributed and EM models for interconnects; delay, crosstalk and switching noise; moment matching techniques; concurrent thermal/electrical analysis of IC packages and boards.

Engineering 97.555F1 (ELG6355)

### **Passive Circuit Theory**

General description of networks leading to matrix representations. Elements of matrix algebra as applied to networks. Properties of network functions; poles and zeros of driving point and transfer functions. Foster and Cauer canonic forms. Synthesis of lossless two-ports, single and double-terminated.

Engineering 97.556W1 (ELG6356)

### **Simulation and Optimization of Electronic Circuits**

Introduction to computer simulation and optimization of electrical circuits. Time- and frequency-domain formulations for sensitivity analysis and optimization. Optimization techniques for performance-, cost- and yield-driven design of electronic circuits. Optimization approaches to modelling and parameter extraction of active and passive elements.

Engineering 97.557W1 (ELG6357)

### **Active Circuit Theory**

Characterization of negative resistance one-port networks, signal generation and amplification. Active two-ports;  $y$ ,  $z$ ,  $h$ ,  $k$ , chain and

scattering parameters. Measurement of two-port parameters. Activity and passivity; reciprocity, non-reciprocity, and anti-reciprocity. Stability, inherent and conditional; power gain of conjugate and mismatched two-port amplifiers.

Prerequisite: Engineering 97.555 or equivalent.

Engineering 97.558F1 (ELG6358)

### **Computer Methods for Analysis and Design of VLSI Circuits**

Formulation of circuit equations. Sparse matrix techniques. Frequency and time-domain solutions. Relaxation techniques and timing analysis. Noise and distortion analysis. Transmission line effects. Interconnect analysis and cross-talk simulation. Numerical inversion techniques. Asymptotic waveform estimation. Mixed frequency/time domain techniques. Sensitivity analysis.

Engineering 97.559F1 (ELG6359)

### **Integrated Circuit Technology**

Survey of technology used in silicon VLSI integrated circuit fabrication. Crystal growth and crystal defects, oxidation, diffusion, ion implantation and annealing, gettering, CVD, etching, materials for metallization and contacting, and photolithography. Structures and fabrication techniques required for submicron MOSFETs. Applications in advanced CMOS processes.

Engineering 97.560F1 or W1 (ELG6360)

### **Digital Integrated Circuit Testing**

Production testing of digital integrated circuits. Outline of methods of testing used in production. Testing schemes and design for testability. Faults and fault models, yield estimates, testability measures, fault simulation, test generation methods, sequential testing, scan design, boundary scan, built-in self test, CMOS testing.

Engineering 97.562W1 (ELG6362)

### **Microwave Semiconductor Devices and Applications**

Theory of operation for microwave diodes (varactor, p-i-n, Gunn, IMPATT) and transistors (BJT, MESFET, HBT, HEMT). Small-signal, large-signal, and noise models for CAD. Diode oscillators and reflection amplifiers. Design of transistor oscillators and amplifiers. Discussion of technology/fabrication issues and MMIC applications.

Engineering 97.563W1 (ELG6363)

### **Electromagnetic Wave Propagation**

Review of groundwave, skywave and transionospheric propagation modes relevant to radar, communications and other systems operating in the medium to extra high frequency bands. Electromagnetic noise: physical principles involved, modelling and prediction techniques, and limitations of such techniques in practical situations.

Engineering 97.564W1 (ELG6364)

### **Radar Systems**

Fundamentals; range equation, minimum detectable signal, radar cross-section, pulse repetition frequency, range ambiguities. Radar classes: CW, FM-CW, MTI, tracking, air surveillance, SSR, PAR, MLS, SAR, SLAR, OTH, 3D and bistatic radars. Radar subsystems; transmitters, antennas, receivers, processors, displays, detection criteria; CFAR receivers, noise, clutter precipitation.

Engineering 97.565F1 (ELG6365)

### **Optical Fibre Communications**

Transmission characteristics of and design considerations for multi-mode and single-mode optical fibre waveguides; materials, structures, and device properties of laser light sources; properties and performance of p-i-n and avalanche photodiodes; types of optical fibre signal formats, preamplifier topologies, noise, receiver sensitivity, transmitter design, link design.

Engineering 97.566F1 (ELG6366)

### **Phase-Locked Loops and Receiver Synchronizers**

Phase-locked loops; components, fundamentals, stability, transient response, sinusoidal operation, noise performance, tracking, acquisition and optimization. Receiver synchronizers: carrier synchronizers including squaring loop, Costas loop, and remodulator for BPSK, QPSK BER performance; clock synchronizers including early-late gate, in-phase/midphase, and delay-line multiplier.

Engineering 97.567F1 (ELG6367)

### **Antennas and Arrays**

Design projects are interspersed with live and video lectures. Lectures cover definitions, wire structures, mutual coupling, method-of-moments, array theory, photonic devices, frequency independent structures, reflectors, horns, feeds, slotted waveguide and microstrip arrays. Design projects include a printed dipole, yagi and series-fed microstrip patch array.

Engineering 97.568W1 (ELG6368)

### **Fourier Optics**

The theory and applications of diffractive and non-diffractive coherent optics, with emphasis on holograms, tomography and high-speed optical computing. Mathematical basis: generalized 2-D Fourier transforms, transfer function of an optical system, 2-D sampling theory, Helmholtz equation, Green's theorem, and the classical diffraction theories.

Engineering 97.569W1 (ELG6369)

### **Nonlinear Microwave Devices and Effects**

The physical basis and mathematical modelling of a variety of microwave/millimeter-wave devices, (some of which exhibit the most extreme nonlinear behaviour known), how they can be exploited in practical circuits and sys-

tems, and how the resulting device/circuit interactions can be analyzed.

Engineering 97.572F1 (ELG6372)

### **Optical Electronics**

Electromagnetic wave propagation in crystals; review of geometric optics; Gaussian beam propagation; optical fibres; dielectric waveguides for optical integrated circuits; optical resonators; optical properties of materials; theory of laser oscillation; specific laser systems; electro-optic modulators; photorefractive materials and applications; holography; optical interconnects.

Engineering 97.573F1 or W1 (ELG6373)

### **Advanced Topics in Solid State Devices and IC Technology**

Recent and advanced topics in semiconductor device physics, modelling, and integrated circuit fabrication technology. Topic varies from year to year according to departmental research interests. Students may be expected to contribute lectures or seminars on selected topics.

Engineering 97.574F1 or W1 (ELG6374)

### **Advanced Topics in CAD**

Recent and advanced topics in computer-aided techniques for the design of VLSI and telecommunications circuits. Topics will vary from year to year according to the departmental research interests. Students may be expected to contribute lectures or seminars on selected topics.

Engineering 97.575F1 or W1 (ELG6375)

### **Advanced Topics in VLSI**

Recent and advanced topics in the design of very large scale integrated circuits, with emphasis on mixed analog/digital circuits for telecommunications applications. Topic varies from year to year according to departmental research interests. Students may be expected to contribute lectures or seminars on selected topics.

Engineering 97.576F1 or W1 (ELG6376)

### **Submicron CMOS and BiCMOS Circuits for Sampled Data Applications**

The analog aspects of digital CMOS and BiCMOS circuit design in submicron technologies including reliability; sampled analog circuits, including amplifier non-ideal characteristics and switch charge injection; CMOS/BiCMOS amplifier design considerations, leading up to standard folded-cascode and two-stage circuits.

Engineering 97.577W1 (ELG6377)

### **Microelectronic Sensors**

Fabrication and physical principles of operation of microelectronic sensors. A large variety of sensors will be studied and the basic fabrication methods used in their production reviewed. The devices discussed will include optical sensors, fibre optic sensors, magnetic sensors, temperature sensors and, briefly, chemical sen-

sors.

Engineering 97.578F1 (ELG6378)

**ASICs in Telecommunications**

Modern ASIC technologies for Telecom will be introduced. Circuit level building blocks for typical wireline and wireless applications will be overviewed. Both analog and digital circuits will be considered. A topical literature study, circuit level design exercises and take home final exam will be required.

Engineering 97.579W1 (ELG6379)

**Advanced Topics in Electromagnetics**

Recent and advanced topics in electromagnetics, antennas, radar systems, microwave devices and circuits, or optoelectronics. The subject material will vary from year to year according to research interests in the department and/or expertise provided by visiting scholars or sessional lecturers.

Engineering 97.580F1 (ELG6380)

**Theory of Semiconductor Devices**

Equilibrium and non-equilibrium conditions in a semiconductor. Carrier transport theory. Physical theory of basic semiconductor device structures and aspects of design: PN junctions and bipolar transistors, field effect devices. Current transport relationships for transistors. Charge control theory. Modelling of device mechanisms. Performance limitations of transistors.

Engineering 97.582W1 (ELG6382)

**Surface-Controlled Semiconductor Devices**

Fundamentals of the MOS system; MOS capacitors. Long channel behaviour: theory, limitations and performance of the SPICE level 1 and 2 models. Small geometry effects. Sub-threshold operation and modelling. Hot electron effects and reliability.

Engineering 97.583F1 (ELG6383)

**Behavioural Synthesis of ICs**

Various topics related to computer analysis and synthesis of VLSI circuits including: logic synthesis, finite state machine synthesis, design methodologies, design for reuse, testing, common VLSI functions, a review of Verilog. Prerequisite: Some IC design knowledge such as given in Engineering 97.478.

Engineering 97.584F1 (ELG6384)

**VLSI Design**

An IC design course with a strong emphasis on design methodology, to be followed by 97.585 in the second term. The design philosophies considered will include Full Custom design, standard cells, gate-arrays and sea-of-gates

using CMOS and BiCMOS technology. State-of-the-art computer-aided design tools are used.

Engineering 97.585W1 (ELG6385)

**VLSI Design Project**

Using state-of-the-art CMOS and BiCMOS technologies, students will initiate their own design of an integrated circuit using tools in the CAD lab and submit it for fabrication where the design warrants.

Engineering 97.588F1 (ELG6388)

**Signal Processing Electronics**

CCDs, transversal filters, recursive filters, switched capacitor filters, with particular emphasis on integration of analog signal processing techniques in monolithic MOS lcs. Detailed op amp design in CMOS technology. Implications of nonideal op amp behaviour in filter performance. Basic sampled data concepts.

Engineering 97.590F1, W1, S1

**Engineering Project I**

A one-term course, carrying 0.5 credit, for students pursuing the course work M.Eng. program. An engineering study, analysis and/or design project under the supervision of a faculty member. Written and oral reports are required. This course may be repeated for credit.

Engineering 97.591F2, W2, S2

**Engineering Project II**

A one-term course, carrying full-course credit, for students pursuing the course work or co-op M.Eng. program. An engineering study, analysis and/or design project under the supervision of a faculty member. Written and oral reports are required. This course may be repeated for credit.

Engineering 97.596F1, W1, S1

**Directed Studies**

Various possibilities exist for pursuing directed studies on topics approved by a course supervisor, including the above listed course topics where they are not offered on a formal basis.

Engineering 97.599F4, W4, S4

**M.Eng. Thesis**

Engineering 97.699F, W, S

**Ph.D. Thesis**

# Electrical and Computer Engineering (University of Ottawa) School of Information Technology and Engineering (SITE)

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## The School

**Director,** E. Petriu

**Graduate Program Coordinator,** A. Yongacoglu

SITE is one constituent of the Ottawa-Carleton Institute for Electrical and Computer Engineering as also of the Ottawa-Carleton Institute of Computer Science. Consult the Institute's entry in this calendar for a faculty list, graduate program descriptions and admissions requirements.

## School Facilities

### Computing Facilities

Students registered in the Electrical and Computer Engineering program have access to leading edge computing equipment, offering both the popular PC windows environment and Unix systems. The general-access graduate computing facilities consist of 25 PCs and a network of Sun workstations and servers distributed in a number of labs. The operating systems available to students include Windows, Linux and the Sun Solarix UNIX environment. Depending on his/her supervisor, a student may also get access to one of the many research groups' private computing laboratory.

### Communications and Signal Processing (CASP) Research Laboratory

This laboratory is equipped with a variety of communication system and signal analysis equipment as well as computing facilities. This includes some of the latest equipment for data source simulation, data error rate monitoring, spectrum analysis, cross and autocorrelation function measurement, probability density function measurement, noise simulation, filtering, etc. It also includes prototype digital modulation and demodulation equipment, and various digital signal processing hardware and software systems. Two DSP-based (TMS-Smaster C67x) prototype development platforms are controlled by workstations with Pentium 3 processors. The laboratory also features a 14/12 GHz satellite earth station and associated terminal equipment for testing prototype equipment on an actual satellite link. The computing facilities include several high speed PCs and Sun workstations.

### Lightwave Communications Research Laboratory

This laboratory is equipped with many modern optical communications instruments covering wavelengths in the range of 600nm to 1500nm. The laboratory also has several UNIX workstations, and Macintosh and PC computers interconnected on the department's networks. The computing facilities are equipped with software packages used for computer simulation of various aspects of optical communication systems and networks. The laboratory is also equipped with audio-video equipment for image communication over fibre networks and two bench-top fibre local area networks that use WDM and/or CDM on the physical layer.

### Multimedia Communications Research Laboratory

This laboratory has developed many applications in telemedicine, distance learning and web-based telecollaboration and licensed some to industry. It is now focusing on Distributed and Collaborative Virtual Environments, with applications to e-commerce and industrial training, on Wireless Multimedia for portable digital devices and on Intelligent Sensors for Pervasive Computing applications. MCRLab is part of the National Capital Institute of Telecommunications (NCIT), and also funded by three centres of excellence (CITO, CITR, TeleLearning), several government sources and industry.

The laboratory is equipped with: a variety of over twenty PCs running Windows NT (some with Linux as a second boot option); two IBM RS-6000, running AIX, with FORE OC-3 ATM cards, ethernet cards and one equipped with IBM Ultimeidia MJPEG card; one Sun ULTRA 170 workstation, running Solaris 2.51 and equipped with an ATM OC-3 card; two Sun SPARC 20 workstations, running Solaris 2.5 and equipped with Parallax and ATM OC-3 cards; One SGI O2, running IRIX; One SGI Indy, running IRIX;

Visualization equipment includes a major Silicon Graphics ONYX2 supercomputer and Virtual Reality Facility, as also small and large TV monitors, video cameras, Electro home projector with large projection screen for 3D visualization, and one EPSON video projector.

Networking is provided by IP over Fast Ethernet and ATM.

The Ethernet connectivity is provided through a 3Com Fast-Ethernet Switch and three Netgear Fast Ethernet hubs.

Multimedia conferencing software and various MPEG decoders are also available.

## Electromagnetic Research Laboratory

This laboratory is equipped with modern coaxial line and waveguide instruments covering frequencies from 10 MHz to 60 GHz. A computer-controlled frequency domain network analyzer with error correcting capabilities allows reflection and transmission measurements from 5 Hz to 60 GHz. The laboratory is also equipped with a computer-controlled time domain network analyzer and a modern scalar network analyzer (transmission, reflection test set) as well as various frequency counters and spectrum analyzers. A computer controlled three-dimensional scanning system is located in an anechoic chamber and may be used for near-field antenna measurement in both frequency and time domains over the frequency range from 100 MHz to 3GHz. TEM cells at 100 MHz and 3 GHz are available for field probe calibration and EMC/I testing of electronic equipment.

## Graduate Courses

Engineering 92.505 (ELG5162)

### Knowledge-Based Systems: Principles and Design

Introduction to Lisp and Objective C. Knowledge representation using rules, semantic nets, frames. State space representation. Procedural and declarative knowledge. Demons. Production systems. Solution searching algorithms. Expert system components. Inferenc engine principle and representation. Knowledge-based system design. Case study: expert system for process control.

Engineering 92.506 (ELG7132)

### Topics in Electronics I

Current topics in the field.

Engineering 92.507 (ELG7133)

### Topics in Electronics II

Current topics in the field.

Engineering 92.508 (ELG5755)

### Sujets choisis en électronique

Sujets d'intérêt courant dans la matière.

Engineering 92.510 (ELG5163)

### Machine Vision

Image acquisition. Structured light and stereo ranging. Grey-scale and binary images: geometric and topological properties. Image segmentation, preprocessing, edge finding, processing. Image recognition. Mathematical models. Morphology. Representation of 3-D objects, scene understanding, motion detection. Massively parallel computers architectures. Machine vision for manufacturing. Prerequisite: ELG4153 or the equivalent.

Engineering 92.511 (ELG7199)

### Directed Studies

Various possibilities exist for pursuing directed studies on topics approved by the Department and which a full-time faculty member has agreed to direct, including any of the courses listed in the Graduate Calendar that are not being offered on a formal basis in the current academic year.

Engineering 92.512 (ELG5197)

### Introduction to Embedded Systems

Embedded systems' general characteristics, niche, and design alternatives. Simple embedded systems: sequential event response systems, cyclic executives. Prototype based designs, multitasking and multactivity paradigms. Multitasking system design: elements of real-time operating systems and harmony. Multiactivity system design: PAL and PAL-based design tools.

Prerequisite: ELG4161 or the equivalent.

Engineering 92.513 (ELG5198)

### Parallel Processing with VLSI

Parallel processing architectures: array, vector, associative, and orthogonal processors. Switch lattice architecture, hypercubes, systolic arrays, wavefront arrays, pyramid structures, data flow architectures. Memory organization, buses, I/O and interconnection networks. Connection machine processing hardware, RISC and VLSI processors. GaAs technology. Examples of parallel processing architectures.

Engineering 92.514 (ELG5199)

### Design of Multimedia Distributed Database Systems

Database concepts and architectures. Data modeling, Relational technology and distributed databases. Examples of the new generation of databases for advanced multimedia applications such as multimedia information retrieval, VOS and the limitations of the conventional models for managing multimedia information (graphics, text, image, audio and video).

Engineering 92.515 (ELG5373)

### Secure Communications and Data Encryption

Secure communications: encryption and decryption. Entropy, equivocation and unicity distance. Cryptanalysis and computational complexity. Substitution, transposition and product ciphers. Data Encryption Standard (DES): block and stream cipher modes. Modular arithmetics, Public key cryptosystems: RSA, knapsack. Factorization methods. Elliptic curve cryptography. Authentication methods and cryptographic protocols.

Prerequisite: ELG5119 or 94.553 or the equivalent.

Engineering 92.516 (ELG5113)

### **Stochastic Systems**

Wiener processes. Poisson random measures. Stochastic Wiener-Ito integrals. Stochastic integrals relative to Poisson measures. Stochastic differentials. Diffusion processes. Ito-stochastic differential equations: existence, uniqueness of solutions, continuous dependence of solutions to parameters. Semigroup theory. Generation of semigroups applied to stochastic differential equations. Applications to engineering systems modelling.

Prerequisite: Permission of the instructor.

Engineering 92.517 (ELG5121)

### **Multimedia Communications**

Introduction, applications, standards. Networking technologies. Image, video and audio compression. Quality of service and resource management. Scheduling issues for real-time MM transport. Multimedia synchronization. Multimedia and the Internet. Multimedia conferencing. Multimedia to the home. Satellites and multimedia. Multimedia applications.

Engineering 92.518 (ELG5382)

### **Switching and Traffic Theory for Integrated Broadband Networks**

Principles of switching theory. Asynchronous Transfer Mode switching architectures. Principle of teletraffic engineering. Queueing theory and performance evaluation techniques as applied to the study of computer network architectures. Current topics in computer network modelling analysis and traffic control for high-speed multimedia networks.

Prerequisite: ELG5374 (92.567) or ELG 6121 (94.521) or the equivalent. Corequisite: ELG5119 (92.519) or ELG6153 (94.553) or ELG6103 (94.503) or the equivalent.

Engineering 92.519 (ELG5119)

### **Stochastic Processes**

Probability. Random variables. Distribution and density functions. Expectation. Functions of random variables. Moments and characteristic functions. Random vectors. Sequences of random variables and convergence. Limit theorems. Stochastic processes: basic notions. Stationarity. Ergodicity. Poisson and Gaussian processes. Second order processes. Representation theorems. Markov processes and chains. Precludes additional credit for Engineering 94.553 (ELG6153).

Engineering 92.520 (ELG5120)

### **Queueing Systems**

Resource sharing issues: delay, through-put and queue length. Basic queueing theory: Markov chains, birth and death processes.  $M/M/m/k/n$  queues, bulk arrival/service systems. Little's Rule. Intermediate queueing theory:  $M/G/1$ ,  $G/M/m$  queues. Advanced queueing theory:  $G/G_m$  queue, priority queue, network of queues, etc. Queueing applications.

Precludes additional credit for Engineering

94.517 (ELG6117)

Prerequisite: One of ELG5119, 94.503 or 94.553 or the equivalent.

Engineering 92.521 (ELG5121)

### **Multimedia Communications**

Introduction, applications, standards. Networking technologies, Image, video and audio compression. Quality of service and resource management. Scheduling issues for real-time MM transport. Multimedia synchronization. Multimedia and the Internet. Multimedia conferencing. Multimedia to the home. Satellites and multimedia. Multimedia applications.

Engineering 92.522 (ELG5122)

### **Modelling, Analysis and Performance Evaluation in Computer Communications**

Network performance issues and their mathematical analysis techniques. Intermittently available server model, probing and tree search techniques, delay cycle, switch/network topology and reliability. Analysis of controlled and random access methods, routing allocation/control, topological design. Selected topics from current literature on various network applications

Precludes additional credit for ELG7186 (92.566).

Prerequisites: ELG5120 (92.520), ELG5374 (92.567) or 94.521 (ELG6121); or the equivalents.

Engineering 92.523 (ELG5191)

### **Design of Distributed System Software**

Distributed systems design and programming issues; distributed computing. Basics of object oriented technology for distributed computing. Distributed objects technologies; CORBA and JAVA. Object oriented models for distributed programming. Distributed client server architecture design. Scalability, interoperability, portability and CORBA services. CASE tools for designing distributed applications.

Precludes additional credit for ELG7186 (92.587) (if taken in 1997-98).

Prerequisites: an undergraduate degree in Computer Engineering, or Computer Science, or practical experience in system software design.

Engineering 92.527 (ELG5161)

### **Robotics: Control, Sensing and Intelligence**

Robotics as the intelligent connection of perception to action. Advanced robotics technologies. Robot arm kinematics and dynamics. Planning of manipulator trajectories. Control of robot manipulators. Robot-level programming. Sensors and sensory perception. Control problems for sensory controlled robotic-based flexible manufacturing systems. Task-level programming. Knowledge-based control for mobile robots.

Prerequisite: ELG4161 or the equivalent.

Engineering 92.529 (ELG7113)

**Topics in Systems and Control I**

Current topics in the field, including linear semigroup theory and optimal feedback control.

Engineering 92.530 (ELG7114)

**Topics in Systems and Control II**

Current topics in the field, including linear and non-linear filtering and optimal control of stochastic systems.

Engineering 92.531 (ELG7574)

**Sujets choisis en systèmes et réglage automatique.**

Sujets d'intérêt courant dans le domaine.

Engineering 92.535 (ELG5108)

**Electromagnetic Compatibility and Interference**

Interference phenomena. Shielding of conductors. Grounding. Other noise reduction techniques. EMI filters. Noise sources: narrowband and broadband. Electromagnetic pulse as an interference source. Modelling EMI/C circuit boards and backplanes.

Prerequisite: ELG4103 or the equivalent.

Engineering 92.538 (ELG7500)

**Sujets choisis en électromagnétisme.**

Sujets d'intérêt courant dans la matière.

Engineering 92.541 (ELG5104)

**Electromagnetic Waves: Theory and Applications**

The homogeneous wave equation. Uniform and non-uniform plane waves. Inhomogeneous wave equations. Green's functions. Theory of potentials. Scattering problems. Numerical methods. Boundary value problems. Perturbation and variational techniques.

Prerequisite: ELG4101 or the equivalent.

Engineering 92.542 (ELG5379)

**Numerical Methods in Electromagnetic Engineering**

Review of electromagnetic and potential theory. Formulation of static and electrodynamic problems. Introduction to numerical and field-theoretical modelling techniques. Numerical methods considered: FD, MoL, SDA, TLM and BPM. Examples of commonly encountered electromagnetic problems at microwave, millimeter-wave and optical frequencies.

Prerequisites: ELG4103 or the equivalent.

Engineering 92.543 (ELG5504)

**Ondes électromagnétiques: théorie et applications**

Équation homogène d'ondes. Ondes planes uniformes et non uniformes. Équation non homogène d'ondes. Fonctions de Green. Théories des potentiels. Problèmes de diffraction. Méthodes numériques. Problèmes avec conditions aux limites. Méthodes des perturbations et variation.

Prerequisite: ELG4103 or the equivalent.

Engineering 92.544 (ELG7100)

**Topics in Electromagnetics I**

Current topics in the field.

Engineering 92.545 (ELG7101)

**Topics in Electromagnetics II**

Current topics in the field.

Engineering 92.546 (ELG5779)

**Méthodes numériques en génie électromagnétique**

Revue de l'électromagnétisme et de la théorie des potentiels. Formulation de problèmes statiques et électrodynamiques. Introduction aux méthodes numériques et théoriques. Méthodes numériques considérées: FD, MoL, SDA, TLM et BPM. Exemples de problèmes types rencontrés en électromagnétisme aux hyperfréquences et en optique. Prerequisite: ELG4103 and ELG4104, or the equivalent.

Engineering 92.550 (ELG5371)

**Digital Communications by Satellite**

Propagation and interference considerations. Link budget calculations. GEO, LEO, HEO systems. Transponders. Earth stations; modems (PSK, MSK, etc.), low noise amplifiers, high power amplifiers. Error control. Access techniques; FDMA, TDMA, CDMA, random access. Switching, onboard processing. Networking. ATM over satellites. Mobile satellite communications and IMT2000.

Prerequisite: ELG4171 or the equivalent.

Engineering 92.551 (ELG5170)

**Information Theory**

Measure of information: entropy, relative entropy, mutual information, asymptotic equipartition property, entropy rates for stochastic processes; Data compression: Huffman code, arithmetic coding; Channel capacity: random coding bound, reliability function, Blahut-Arimoto algorithm, Gaussian channels, coloured Gaussian noise and «water-filling»; Rate distortion theory; Network information theory.

Prerequisite: ELG5119 (92.519) or 94.553 (ELG5119) or the equivalent.

Engineering 92.553 (ELG5179)

**Detection and Estimation**

Binary, M-ary, composite hypothesis testing. Bayes risk and Neyman-Pearson criteria. Parameter estimation: Cramer-Rao bounds; maximum-likelihood estimation. Detection in additive white Gaussian noise and coloured noise. Noise in noise problems. Classical estimation problems. Linear filtering problem. Weiner/Kalman filtering. Sequential and non-parametric detection.

Prerequisites: ELG5119 or 94.553; and ELG5375 or 94.554; or the equivalents.

Engineering 92.554 (ELG5372)

**Error Control Coding**

General introduction Algebraic concepts. Linear block codes. Cyclic codes, BCH and Reed-Solomon codes. Convolutional codes. Maximum likelihood decoding; and sequential decoding of convolutional codes. Burst-error correcting convolutional and block codes. Automatic repeat request. Trellis Coded Modulation. Turbo codes and iterative decoding. Co-requisite: ELG4171 or the equivalent.

Engineering 92.556 (ELG5375)

**Principles of Digital Communication**

Elements of communication theory and information theory applied to digital communication systems. Characterization of noise and channel models. Analysis of digital data transmission techniques for additive Gaussian noise channels. Efficient modulation and coding for reliable transmission. Spread spectrum and line coding techniques. Precludes additional credit for Engineering 94.554.

Prerequisite: 94.553 or ELG5119 or the equivalent (may be taken concurrently).

Engineering 92.557 (ELG5376)

**Digital Signal Processing**

Review of discrete time signals and systems, A/D and D/A conversions, representation in time, frequency, and Z domain, DFT/FFT transforms, FIR/IIR filter design, quantization effects. Correlation functions. Cepstrum analysis. Multi-rate signal processing. Power spectrum estimation. Introduction to joint time-frequency analysis. DSP architecture: implementation approaches. Applications. Precludes additional credit for Engineering 94.562 (ELG6162).

Engineering 92.558 (ELG5776)

**Traitement numérique des signaux**

Revue des signaux/systèmes en temps discret, conversions A/N et N/A, représentation en temps, fréquence et domaine Z, transformées DFT/FFT, design filtres FIR/IIR, effets de quantification. Fonctions de corrélation. Analyse cepstrale. Traitement à taux multiple. Estimation de puissance spectrale. Introduction analyse temps-fréquence. Architectures DSP: réalisations. Applications. Precludes additional credit for Engineering 94.562 (ELG6162).

Engineering 92.559 (ELG5378)

**Image Processing and Image Communications**

Image acquisition, display and perception: sampling and reconstruction, quantization, human vision. Discrete image representations: colour spaces, block, subband and wavelet representations. Image transformation, enhancement and restoration. Image analysis: edge detection, motion estimation. Image and video compression: lossless coding, predictive and

transform coding, motion compensation.

Prerequisite: ELG5376 or 94.562 or the equivalent.

Engineering 92.560 (ELG7172)

**Topics in Signal Processing I**

Current topics in the field.

Engineering 92.561 (ELG7173)

**Topics in Signal Processing II**

Current topics in the field.

Engineering 92.563 (ELG7179)

**Topics in Signal Processing III**

Current topics in the field.

Engineering 92.565 (ELG7177)

**Topics in Communications I**

Current topics in the field.

Engineering 92.566 (ELG7178)

**Topics in Communications II**

Current topics in the field.

Engineering 92.567 (ELG5374)

**Computer-Communication Networks**

Network applications, structures and their design issues. Resource sharing/access methods. Network transmission and switching techniques. OSI model. Error control, flow control and various issues related to the physical, data link and network layers. Local area networks. Performance issues of delay-throughput in various protocols. Precludes additional credit for Engineering 94.521.

Prerequisite: An undergraduate course in probability and statistics such as MAT2377.

Engineering 92.572 (ELG7572)

**Sujets choisis en télécommunications et en traitement de signaux.**

Sujets d'intérêt courant dans le domaine.

Engineering 92.573 (ELG5194)

**Design and Testing of Reliable Digital Systems**

Introduction. Test generation for combinatorial circuits. Fault detection in sequential circuits. Memory testing. LSI/VLSI circuit testing. Deterministic and random testing of digital circuits. Design for testability. Self-checking circuits. Design of fault-tolerant systems. Case studies.

Prerequisite: ELG5195 or the equivalent.

Engineering 92.574 (ELG5180)

**Advanced Digital Communication**

Techniques and performance of digital signaling and equalization over linear bandlimited channels with additive Gaussian noise. Fading multipath channels; diversity concepts, modelling and error probability performance evaluation. Synchronization in digital communications. Spread spectrum in digital transmission over multipath fading channels.

Precludes additional credit for Engineering 94.565.

Prerequisite: 94.554 or ELG5375 or the equivalent.

Engineering 92.575 (ELG5195)

### **Digital Logic Design: Principles and Practices**

Switching algebra. Combinational circuit design including PLA and MSI techniques. Special properties-symmetric functions,unate functions, threshold functions, functional decomposition. Sequential circuits-state reduction, incompletely specified machines, state assignments and series-parallel decomposition. Fundamental mode sequential circuits-race, hazards, and state assignment. Semicustom and MSI design. Special sequential circuits.

Engineering 92.579 (ELG5196)

### **Neural Networks and Fuzzy Systems**

Neuro-fuzzy and soft computing. Fuzzy set theory: rules, reasoning, and inference systems. Regression and optimization; derivative-based optimization-genetic algorithms, simulated annealing, downhill simplex search. Neural Networks: adaptive networks; bidirectional associative memories; supervised and unsupervised learning; learning from enforcement. Applications.

Precludes additional credit for Engineering 94.561 (ELG6161).

Engineering 92.580 (ELG5377)

### **Adaptive Signal Processing**

Theory and techniques of adaptive filtering, including Wiener filters, gradient and LMS methods; adaptive transversal and lattice filters; recursive and fast recursive least squares; convergence and tracking performance; implementation. Applications, such as adaptive prediction; channel equalization; echo cancellation; source coding; antenna beamforming; spectral estimation.

Precludes additional credit for Engineering ELG6160.

Prerequisite: 94.553 or ELG5119 or the equivalent; 94.562 or ELG5376 or the equivalent.

Engineering 92.587 (ELG7186)

### **Topics in Computers I**

Current topics in the field.

Engineering 92.587 (ELG7187)

### **Topics in Computers II**

Current topics in the field.

Engineering 92.590 (ELG7573)

### **Sujets choisis sur les ordinateurs.**

Sujets d'intérêt courant dans la matière.

Engineering 92.526 (ELG 5123)

### **Health Care Engineering**

Overview of health care system/participants: biophysical measurements for diagnosis/monitoring; biomedical sensors/technology; telemedicine and applications; safety consid-

erations; managing medical technologies/funding models for clinical engineering departments; considerations for developing countries.

Prerequisites: Permission of the Department.

Engineering 92.524 (ELG5124)

### **Virtual Environments**

Basic concepts. Virtual worlds. Hardware and software support. World modeling. Geometric modeling. Light modeling. Kinematic and synaemic models. Other physical modeling modalities. Multi-sensor data fusion. Anthropomorphic avatars. Animation: modeling languages.. scripts, real-time computer architectures. VE interfaces. Case studies.

Engineering 92.525 (ELG5125)

### **Quality of Service Management for Multimedia Applications**

Design principles: layering, protocols, interfaces; open distributed processing models; real-time requirement; request-response and stream processing, real-time scheduling, design for performance and scalability; user perspective versus system performance, cost/performance trade-offs, negotiations; adaptive and mobile applications; examples of multimedia applications, protocols.

Prerequisite: Engineering 92.567 (ELG5374) or 94.521 (ELG6121) or equivalent.

Engineering 92.526 (ELG5126)

### **Source Coding and Data Compression**

Discrete and continuous sources. Discrete sources: Huffman coding and run length encoding. Continuous sources: waveform construction coding: PCM, DPMC, delay modulation, speech compression by parametric extraction; predictive encoding; image coding by transformation and block quantization. Fourier and Walsh transform coding. Applications to speech, television, facsimile.

Prerequisite: Engineering 94.553 (ELG6153) or ELG5119 (92.519), or equivalent.

ELG6000

### **Engineering Report/Rapport technique**

For students in the course work master's program working on the Engineering Report. Pour les étudiants et les étudiantes à la maîtrise qui préparent un rapport technique.

ELG7999

### **M.A.Sc. Thesis/Thèse de M.Sc.A.**

For students working towards their master's thesis. Pour les étudiants et les étudiantes qui travaillent à leur thèse de maîtrise.

ELG8000

### **Co-op Work Term I/Travail coopératif 1er stage**

For students in a cooperative master's program who are on their first work term.

Pour les étudiants et les étudiantes à un programme coopératif de maîtrise qui font leur première session de travail.

ELG8001

**Co-op Work Term II/Travail coopératif 2e stage**

For students in a cooperative master's program who are on their second work term.

Pour les étudiants et les étudiantes à un programme coopératif de maîtrise qui font leur deuxième session de travail.

ELG9998

**Ph.D. Comprehensive Exam/Examen de synthèse du doctorat**

For students undergoing the Ph.D. comprehensive examination.

Pour les étudiants et les étudiantes qui doivent passer l'examen de synthèse du doctorat.

ELG9999

**Ph.D. Thesis/Thèse de doctorat**

For students working towards their Ph.D. thesis.

Pour les étudiants et les étudiantes qui travaillent à leur thèse de doctorat.

# English Language and Literature

Dunton Tower 1812  
Telephone: 520-2310  
Fax: 520-3544

## The Department

**Chair of the Department:** L.T.R. McDonald

**Departmental Supervisor of Graduate Studies,** R.L. Hogg

The Department of English Language and Literature offers programs of study leading to the M.A. degree in English language and literature. Additional information may be obtained by consulting the departmental supervisor of graduate studies.

## Qualifying-Year Program

Applicants who hold a general (3 year) B.A. degree with at least a high honours standing (normally B+), with a major in English language and literature, may be admitted to the qualifying-year program. Normally, these students will be required to complete 4.0 or 5.0 credits in English, as determined by the department, and to maintain a high honours standing (normally B+) before being considered for admission into the master's program. The regulations governing the qualifying year are outlined in the general section of this calendar (see p.55).

## Master of Arts

### Admission Requirements

The minimum admission requirement for the master's program is a B.A. (Honours) (or the equivalent) in English language and literature, with at least a high honours standing (normally B+ or better)

Possession of the minimum entrance standing is not in itself, however, an assurance of admission into the program.

### Program Requirements

Each candidate will select one of the following program patterns:

\* 2.0 credits in English, selected from those at the 500-level (excluding English 18.598), plus English 18.505, and a master's thesis; an oral examination on the thesis will be required. A prospectus for the thesis must be submitted to the graduate committee by December 1 after registration in September, or at the end of three months for any other registration

\* 3.0 credits in English selected from those at the 500-level (excluding English 18.599), plus English 18.505, and a research essay; an oral examination on the research essay will be required

Each program is designed to be completed within the three-term academic year. Each program is of equal status.

## Guidelines for Completion of Master's Degree

Full-time master's candidates are expected to complete all requirements in twelve months or three terms of registered full-time study. Part-time master's candidates are expected to complete their degree requirements within an elapsed period of six calendar years after the date of initial registration.

All candidates are required to demonstrate a reading knowledge of one language other than English, approved by the Department.

## Academic Standing

A standing of B- or better must be obtained in each credit counted towards the master's degree.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet, published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

English 18.500F1 or W1

### Literary Criticism

A study of specific topics or particular areas of literary criticism. (Also listed as Comparative Literary Studies 17.502.)

English 18.502F1

### Contemporary Literary Theory

This course examines contemporary approaches to theory and literary studies. The first half of the semester is devoted to an overview of current theoretical approaches to literature, and the second half focuses on the work of Sigmund Freud, Jacques Derrida, and Michel Foucault.

English 18.503W1

### Feminism/s: The Literary Dimension

An examination of the configurations and discursive constructions of various cultural "spectacles," such as certain murder trials, disease outbreaks, sexual scandals, and violence in (and out of) sport; performance of race and gender in popular culture and how these performances influence cultural assumptions and expectations..

English 18.504F1

**Literature, Contact, and Empire in Colonial and Post-Colonial Societies**

An investigation of specific European and North American documents relating to the dispossession of Native peoples from the Caribbean to the Arctic, together with the emergence of a radical critique by various Native and non-Native thinkers (Colombus, Montaigne, Cartier, Defoe, Hearne, Cooper, Jameson, Thompson, etc.)

English 18.505F1

**Bibliography and Scholarly Methods**

An introduction to analytical and descriptive bibliography, editing, research methodology, and professional concerns. The course is graded Satisfactory/Unsatisfactory.

English 18.518F1 or W1

**Old Norse**

Topic may vary from year to year.

English 18.528F1 or W1

**Middle-English Studies**

A study of selected portions of Chaucer's *Canterbury Tales*. Also offered at the undergraduate level, with different requirements, as English 18.428★, for which additional credit is precluded.

English 18.531F1 or W1

**Renaissance Poetry**

Topic may vary from year to year.

English 18.532F1 or W1

**Seventeenth-Century Poetry**

A study of selected seventeenth-century poets.

English 18.534W1

**Renaissance Drama**

Politics and the English Renaissance Stage. A study of the popular drama of Marlowe, Shakespeare, Jonson, Marston, Webster, and Tourneur, and the court drama of Peele, Jonson, Shirley, and Carew.

English 18.537F1 or W1

**Renaissance Authors**

A study of selected Renaissance authors.

English 18.538F1 or W1

**Renaissance Studies**

Topic may vary from year to year.

English 18.542W1

**Eighteenth-Century Studies**

Depictions of Friendship and Gender. An examination of the writings of Swift, Pope, and Johnson with respect to the concept of friendship and the depiction of gender. Works are examined from historical, biographical, and psychological points of view.

English 18.548W1

**Studies in Romanticism**

An examination of the fantastic element in some key texts of Romantic literature. The emphasis is on imaginative structures and on the romantic exploration of the mysterious, the exotic, and the forbidden.

English 18.551W1

**Nineteenth-Century Studies**

A study of works written between 1830 and 1870 in terms of gender representation in relation to generic modalities, exploring the thesis that poets of the period -Tennyson, the Brownings, the Rossettis, Arnold, Clough - confronted a crisis in gender ideology that problematized the lyric.

English 18.553 W1

**Nineteenth-Century Fiction**

Topic may vary from year to year.

English 18.558F1 or W1

**Nineteenth-Century Literature**

Topic may vary from year to year.

English 18.561F1 or W1

**Twentieth-Century Poetry**

Topic may vary from year to year.

English 18.563F1 or W1

**Twentieth-Century Fiction**

A study of selected twentieth-century writers.

English 18.564F1 or W1

**Twentieth-Century Drama**

Topic may vary from year to year.

English 18.566F1

**Twentieth-Century Literature**

A study of the portrayal of the media as a reflection of society and its values in the twentieth century British novel, starting with Evelyn Waugh's *Scoop* and completing the survey with Fay Weldon's *Darcy's Utopia* and Martin Amis's *The Information*.

English 18.567F1 or W1

**Twentieth-Century Authors**

A study of twentieth-century authors of fiction.

English 18.568F1 or W1

**Twentieth-Century Studies**

Topic may vary from year to year.

English 18.571F1

**American Poetry**

A study of the formative poetry and poetics of several major modern American writers, including: Whitman, T.S. Eliot, Ezra Pound, William Carlos Williams, H.D., George Oppen, Charles Olson, and Robert Creeley.

English 18.573F1 or W1

**American Fiction**

Topic may vary from year to year.

English 18.576F1 or W1

**American Literature**

Topic may vary from year to year.

English 18.578F1 or W1

**Studies in American Fiction**

Topic may vary from year to year.

English 18.581F1 or W1

**Canadian Poetry**

Topic may vary from year to year.

English 18.582F1

**Ethnicity, Multiculturalism, and Canadian Literature**

A study of Canadian literature in relation to theoretical and critical issues posed by ethnicity and other aspects of Canadian cultural diversity.

English 18.583F1

**Canadian Fiction**

The course concentrates on Canadian writing of the last twenty to thirty years, exploring it with reference to the concept of ideology, within the contexts of Marxist, feminist, and postmodernist literary theories.

English 18.585F1 or W1

**Canadian English**

Topic may vary from year to year.

English 18.587S1

**Selected Topics in Canadian Literature**

Topic may vary from year to year.

English 18.589F1 or W1

**Colonial Discourse and Native Literatures in Canada**

Topic may vary from year to year.

English 18.590 W1

**Selected Topic**

Topic may vary from year to year.

English 18.591F1

**Selected Topic**

Topic may vary from year to year.

English 18.593W1

**English and Cultural Studies**

Performing Bodies and Voices: A consideration of the juncture of literature and popular culture in the twentieth-century American and Canadian contexts. An examination of fusional blues lyric, Beat poetry, folk lyrics, performance art, comic book testimony, rap, Native and gay theatre, spoken word poetry, and dub poetry.

English 18.594F1 or W1

**Special Studies in Dramatic Literature**

Topic may vary from year to year.

English 18.598F2, W2, S2

**Research Essay**

English 18.599F4, W4, S4

**M.A. Thesis**

## Undergraduate Courses

Graduate students may take the equivalent of 1.0 credit at the senior undergraduate level.

## Other Disciplines

Graduate students may take the equivalent of 1.0 credit in a related discipline. The following courses may be among those of special interest:

### *Comparative Literary Studies*

17.501, 17.502 This is not a complete list of all acceptable options. Students should contact the supervisor of graduate studies or the chair of the Department for approval if there are other courses they wish to take which are not on the list.

## Other Universities

Graduate students may take the equivalent of 2.0 credits at another university or other universities. Students are especially reminded that the University of Ottawa offers a wide range of graduate courses which may be completed (under the general 2.0 credit ruling) for credit at Carleton University.

# Environmental Engineering

**Chair, Wayne Parker**

Programs leading to M.Eng and Ph.D. degrees in Environmental Engineering are available through the Department of Civil and Environmental Engineering (see p. 120). Related fields of study and research in environmental engineering are also available through the Ottawa-Carleton Institute for Civil Engineering (see p. 116) (which offers graduate degrees in Civil Engineering) and the Department of Chemical Engineering at the University of Ottawa (which offers graduate degrees in Chemical Engineering).

## Master's Program

### Admission Requirements

The normal requirement for admission to the Master's Program in Environmental Engineering is a four-year bachelor's degree in Environmental Engineering, other related engineering disciplines (Civil, Chemical, Mechanical, etc.), or Environmental Science disciplines.

All students entering the program are required to have courses in mathematics, probability and statistics equivalent to courses required in undergraduate engineering programs. Students admitted without full equivalency in these areas are expected to take appropriate undergraduate courses early in their studies. These courses will be additional to the normal degree requirements.

All students entering the program are also required to have taken undergraduate courses equivalent to the following:

- 88.230 Introduction to Fluid Mechanics
- 81.301 Environmental Engineering Unit Operations
- 81.302 Environmental Engineering Systems Modeling

These courses are considered to provide the minimum background in fluid mechanics, and in physical, chemical, and biochemical treatment principles, necessary to adequately follow environmental engineering courses at the graduate level. Depending on their background, students may have been exposed to these principles through a different combination of courses in their undergraduate curriculum. Students entering the program without an equivalent background in these topics are expected to take these courses early in their studies and they are considered additional to those normally required for the degree.

## Program Requirements

Study at the Master's level can be pursued through either a thesis or a project option. The requirements for course work are specified in terms of credits: one credit = one hour per week for one term.

### Thesis Option

The requirements for the Master's degree by thesis are as follows:

Completion of a minimum of 18 course credits, with at least one course (three credits) from each of at least three of the areas of study listed below;

Participation in the graduate seminar series (EVG 5800 /81.580). The seminar series consists of presentations by graduate students as well as speakers from outside the Environmental Engineering program. Participation in the series consists of attending seminars as well as making at least one presentation;

Completion and successful oral defence of a research thesis (equivalent to 18 course credits).

### Project Option

The requirements for students who pursue the project option are completion of 37 credits, including 27 course credits, the one-credit seminar (EVG 5800 /81.580), and a project equivalent to the remaining nine credits.

## Breadth Requirement

In keeping with the objective of ensuring a breadth of knowledge for graduates of the program, students in the Master's program are expected to take at least one graduate level course from each of at least three of the following areas of study:

- \* Air Pollution
- \* Water Resources Management and Groundwater and Contaminant Transport
- \* Management of Solid and Hazardous and Radioactive Waste and Pollution Prevention
- \* Water and Wastewater Treatment
- \* Environmental Impact Assessment

This requirement serves the objectives of educating graduate professionals who are not only specialized in one area but who are sufficiently familiar with problems and different approaches in the other areas to enable them to interact readily at a technical level with colleagues working in those areas. In addition to the

courses associated with the individual areas, students will be encouraged to select courses from fundamental areas such as chemistry, numerical modeling, and applied statistics.

Master's or Ph.D. candidates transferring from another university must take at least half their courses at Carleton University.

## Doctoral Program

### Admission Requirements

The normal requirement for admission into the Ph.D. Program in Environmental Engineering is completion of either:

1. A Master's degree in Environmental Engineering

or

2. A Master's degree in an engineering discipline with an environmental specialization.

Students wishing to enter the program who do not have either of these backgrounds will be evaluated on a case-by-case basis. Additional course requirements may be specified in some cases.

### Program Requirements

The requirements for the Ph.D. program (from a Master's degree) are as follows:

1. Completion of a minimum of 9 course credits;

2. Participation in the Environmental Engineering seminar series (EVG 7800 / ENVE 7800) (as defined under Master's regulations);

3. Successful completion of written and oral comprehensive examinations in subject areas determined by the advisory committee;

4. Successful presentation of the Ph.D. proposal before the advisory committee;

5. Completion and successful oral defence of a research thesis.

Master's students with outstanding performance in the Master's courses may request transfer into the Ph.D. program without completing the Master's degree. Students who are permitted to do so require 27 course credits for a Ph.D., including any credits transferred from the master's degree program.

Candidates in the Ph.D. program are expected to demonstrate a broad knowledge of the areas within environmental engineering (see *Breadth Requirements under Master's Programs* above). Successful completion of the comprehensive examinations indicates that a candidate has acquired this knowledge. The comprehensive examinations, which should normally be completed within twelve months of registra-

tion, consist of at least three written exams in areas that are determined by the advisory committee and the candidate, and the defense of a written research proposal. One of the written exams is within the specific area of research of the candidate and serves to assess the depth of the candidate's background in this area. The remaining two exams serve to satisfy the objective of assessing the candidate's breadth of fundamental knowledge in two other areas of environmental engineering. These exams are selected by the candidate from a list that is proposed by the advisory committee. Upon completion of the written exams, an oral exam is held if requested by one or more of the committee members. The thesis proposal should normally be defended within 4 months of completion of the written exams.

### Graduate Courses

Course selection is subject to the approval of the adviser or the Advisory committee. Students may choose courses offered at either university from among those listed below.

The courses listed below are grouped by area of study. Students must complete at least one course in three of the five areas. The Director will decide when a course offered under a Special Topics or Directed Studies heading can be considered to meet the requirements of a given area. Course descriptions may be found in the departmental sections of the calendars concerned. Course codes in parentheses are for University of Ottawa (CHG and CVG), and those that begin with the prefix "81" or "82" are offered at Carleton. Only a selection of courses is given in a particular academic year.

#### Air Pollution

CVG 7161 (81.512) Traffic Related Air Pollution (3 cr.)

CVG 7162 (81.513) Ambient Air Quality and Pollution Modeling (3 cr.)

CHG 8132 Adsorption Separation Processes (3 cr.)

EVG 5101 (81.511) Air Pollution Control (3 cr.)

EVG 5104 (81.514) Indoor Air Quality (3 cr.)

#### Water Resources Management, Groundwater Management, and Contaminant Transport

CVG 5125 Statistical Methods in Hydrology (3 cr.)

CVG 5126 Stochastic Hydrology (3 cr.)

CVG 5131 River Engineering (3 cr.)

CVG 7108 (82.554) Seepage and Water Flow through Soils (3 cr.)

CVG 7163 (81.532) Case Studies in Hydrogeology (3 cr.)

CHG 8158 Porous Media (3 cr.)

EVG 5301 (81.531) Hydrogeology and Groundwater Flow (3 cr.)

EVG 5303 (81.533) Unsaturated and Multiphase Flow in Porous Media (3 cr.)

### Management of Solid, Hazardous, and Radioactive Waste and Pollution Prevention

- CVG 5133 Solid Waste Disposal (3 cr.)  
 CVG 5179 Anaerobic Digestion (3 cr.)  
 CVG 6315 Sludge Processing, Utilization, and Disposal (3 cr.)  
 EVG 5201 (81.521) Environmental Geotechnical Engineering (3 cr.)  
 EVG 5202 (81.522) Toxics in Environmental Systems (3 cr.)  
 EVG 5203 (81.523) Hazardous and Radioactive Waste Management (3 cr.)

### Water and Wastewater Treatment

- CVG 5130 Wastewater Treatment Process Design (3 cr.)  
 CVG 5132 Unit Operations of Water Treatment (3 cr.)  
 CVG 5134 Chemistry for Environmental Engineering (3 cr.)  
 CVG 5135 Water Supply and Sanitation in Developing Countries (3 cr.)  
 CVG 5136 Water and Wastewater Treatment Laboratories (3 cr.)  
 CVG 5137 Water and Wastewater Treatment Process Analysis (3 cr.)  
 CVG 5180 Biological Nutrient Removal (3 cr.)  
 CHG 8181 Biochemical Engineering (3 cr.)  
 CHG 8192 Membrane Applications in Environmental Engineering (3 cr.)  
 CHG 8198 Reverse Osmosis (3 cr.)  
 EVG 5001 (81.501) Biofilm Processes in Wastewater Treatment (3 cr.)

### Environmental Impact Assessment

- EVG 5401 (81.541) Environmental Impact Assessment of Major Projects (3 cr.)

### Other Courses

To fulfill the requirements beyond the nine credits of area courses, students may choose from the following:

- CHG 8153 Statistical Modelling and Control of Dynamic Processes (3 cr.)  
 CHG 8186 Modelling of Steady-State Processes (3 cr.)  
 CHG 8194 Membrane Separation processes (3 cr.)  
 CHG 8195 Advanced Numerical Methods in Transport Phenomena (3 cr.)  
 CHG 8196 Interfacial Phenomena in Engineering (3 cr.)  
 CVG 5128 Water Resources Planning and Policy (3 cr.)  
 CVG 7140 (82.561) Statistics, Probabilities, and Decision-Making Applications in Civil Engineering (3 cr.)  
 CVG 7150 (82.534) Intercity Transportation, Planning and Management (3 cr.)

- CVG 7151 (82.535) Traffic Engineering (3 cr.)  
 CVG 7153 (82.537) Urban Transportation Planning and Management (3 cr.)  
 EVG 5402 (81.542) Finite Elements in Field Problems (3 cr.)

Students may also, subject to approval, select courses from the graduate programs in Mechanical Engineering, Biology, Chemistry, Earth Sciences, Computer Sciences, Geography and Public Administration at both universities.

### Seminars, Directed Studies and Special Topics

- EVG 5800 (81.580) Environmental Engineering Seminar (1 cr.)  
 EVG 7800 Environmental Engineering Seminar (1 cr.)  
 EVG 5000 (81.596) Etudes dirigées I / Directed Studies I (3 cr.)  
 EVG 7000 (81.597) Études dirigées II / Directed Studies II (3 cr.)  
 EVG 6800 Special Topics in Environmental Engineering I (3 cr.)  
 EVG 7800 Special Topics in Environmental Engineering II (3 cr.)  
 EVG 8800 Special Topics in Environmental Engineering III (3 cr.)

### Projects and Theses

- EVG 6000 (81.590) Projet en génie de l'environnement / Environmental Engineering Project (9 cr.)  
 EVG 7999 Thèse de maîtrise / Master's Thesis  
 EVG 9998 Examen de synthèse / Comprehensive Examination  
 EVG 9999 Thèse de doctorat / Ph.D. Thesis

# European and Russian Studies

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## The Institute

**Director,** Joan DeBardeleben

An interdepartmental committee was formed in 1963 to foster teaching, research, conferences, and publications in Soviet and East European studies at Carleton. In 1970, a separate department—the Institute of Soviet and East European Studies—was established to administer the interdisciplinary programs developed by the committee. Following the collapse of the Soviet Union at the end of 1991, the Institute of Soviet and East European Studies was renamed the Institute of Central/East European and Russian-Area Studies to reflect the changing political reality in the region. In 1998, the Institute was again renamed, this time as Institute of European and Russian Studies; with the change in name, the Institute's undergraduate program was expanded to cover all of Europe. At the graduate level, the Institute continues to offer an interdisciplinary Master of Arts program in Central/East European and Russian-Area Studies with the participation of faculty members from ten disciplines (art history, business, economics, geography, history, international affairs, law, political science, Russian, and sociology). They are joined on an occasional basis by visiting scholars from outside the University, including invited specialists from Eastern and Central Europe and the successor states to the USSR.

In recent years the Central and East European countries and the former Soviet republics have been in the midst of a transition from one type of socio-economic and political system to another, although they are still linked with each other by earlier historical experience, the common legacy of Soviet-style communism, and by a set of similar problems resulting from that legacy. Since the collapse of the Soviet Union, the field of study remains unified by a concern with understanding the nature of the transitional processes affecting the region, in their multiple social, cultural, economic, and political dimensions. Institute courses and research programs focus on several broad themes. These themes are treated in historical context, with attention to historical roots and parallels of contemporary developments. Major themes include:

\* legacy of the Soviet system in the region and its impact on contemporary developments

\* transition periods in the history of the region, with particular emphasis on political, economic, and social dimensions of the post-communist transition

\* nationalism and ethnicity as forces for change in the area

\* international integration among countries of the region, and the reintegration of the region into European institutions and the larger international community

\* environmental problems and policies in a comparative perspective

\* the changing relationship between state and society, with attention to ethnic, class, and gender issues

At the undergraduate level, the Institute offers an interdisciplinary B.A.(Honours) program in European and Russian Studies. The Institute also administers a program of studies leading to a Master of Arts degree in Central/East European and Russian-Area Studies, the first of its kind in Canada. The curricula for both programs are offered largely through participating departments. The M.A. program is designed for students wishing to acquire specialized knowledge of the region, including proficiency in the use of Russian and/or German as a research tool. The approach is interdisciplinary with emphasis on the social sciences and history. Students may take advantage of the university's regular academic exchanges with post-secondary institutions in Hungary, Poland, Germany and Russia.

## Qualifying-Year Program

Applicants who have a general (3 year) bachelor's degree in one of the disciplines represented in the program, or who lack sufficient area studies or language training, may be admitted to a qualifying-year program designed to raise their status to that of honours graduates in European Studies. Students are expected to achieve high honours standing in qualifying-year courses in order to qualify for admission to the master's year.

To be eligible for admission to the qualifying-year program, an applicant must already have taken some courses in the area of European Studies, so that by the end of the program he or she will have satisfied the basic requirements for admission to the master's program. All students are normally required to have completed the equivalent of an introductory course in Russian or German or, at the discretion of the Institute, two years of another of the region's languages.

## Master of Arts

### Admission Requirements

The normal requirement for admission to the master's program is an honours degree (or equivalent), with at least high honours standing, dealing with East European Studies.

Honours graduates in other disciplines are eligible for admission provided they meet the following requirements:

- \* A total of 7.0 credits (or the equivalent) in the field should have been taken in no fewer than four different departments
- \* At least high honours standing
- \* A reading knowledge of Russian or German (normally equivalent to two academic years of German or Russian instruction or one year with an intensive summer program) or, at the discretion of the Institute, equivalent knowledge of another of the region's languages.

### Program Requirements

The specific requirements in the master's program are the following:

- \* European and Russian Studies 55.500 and 55.501, two 0.5 credit seminars in Central/East European and Russian-Area Studies, offered specially by the Institute and incorporating the approaches of several relevant disciplines
- \* 2.0 credits chosen with the approval of the graduate supervisor from the list below, with at least 1.0 credit (or the equivalent) at the 500-level. No more than 1.0 credit may be taken at the 400-level. No more than 0.5 credit may be taken in the Russian language discipline
- \* One of the following:

European and Russian Studies 55.598, a research essay incorporating the approaches of at least two of the disciplines represented in the program; the research essay must be combined with an additional 1.0 credit, or the equivalent, chosen from those listed below (not including Russian) and must be defended orally

or

European and Russian Studies 55.599, an M.A. thesis which must combine the interdisciplinary approach with a greater degree of originality than that required of the research essay, and which must be defended orally

In both cases (55.598, 55.599) the paper should demonstrate that its author is capable of undertaking research in Russian or German, or in another language used in the region. The 55.599 option cannot be taken without the specific permission of the graduate supervisor.

Each student must demonstrate proficiency in either Russian, German, or one of the region's

other languages. A list of languages which may be selected to meet this requirement is available from the Institute. If the research essay or M.A. thesis involves the study of Russia, then language proficiency must be demonstrated in the Russian language. If the research essay involves the study of Germany, then language proficiency must be demonstrated in the German language. If a language other than Russian or German is selected (a) this language must be utilized in undertaking research for the research essay or M.A. thesis; (b) its selection must be approved by the graduate supervisor; and (c) the student must demonstrate proficiency in the language by passing a written translation examination.

Proficiency in Russian or German may be demonstrated by successful completion of a written translation examination to be administered by the Institute. Proficiency in Russian may also be demonstrated by completion of 36.307★ (Russian Syntax) and 36.308★ (Russian Translation) with a minimum grade of B plus.

Language courses taken to enable a student to fulfill the language requirement cannot be used to fulfill the minimum course requirements for the master's program, described above.

Students are advised to consult with the relevant departments for final course listings for 2000-2001, as changes in curricula may be made too late for inclusion in the Calendar; not all of the courses are offered every year. Undergraduate courses below the 400-level may be taken by qualifying-year students, and by students in the M.A. program as supplementary to the minimum M.A. requirements. (See the program description for the Institute in the *Undergraduate Calendar*.)

#### Art History

11.422 Topics in Eastern Medieval Art

#### Economics

43.486 Comparative Economic Systems I

43.487 Comparative Economic Systems II

43.586, 43.587

#### Geography

45.460 The Changing Geography of Post-Communist Societies

45.570

#### History

24.415 Seminar on European History

24.460 Seminar on Russian History

24.462★ History of Canadian-Soviet Relationships, 1919-1991

24.560, 24.562, 24.580

#### International Affairs

46.522, 46.538, 46.562, 46.584

#### Law

51.488 Socialist Legal Systems

*Political Science*

- 47.431 Marxist Thought
- 47.432 Contemporary Marxism
- 47.461 Foreign Policies of Soviet Successor States
- 47.514, 47.515, 47.516, 47.586

*Russian*

- 36.420 Russian for International Relations I
- 36.421 Russian for International Relations II

*Sociology*

- 53.584

*European and Russian Studies*

- 55.402 State Society Relations in Transition
- 55.403 Social and Political Perspectives in Europe
- 55.405 Environmental Problems and Politics in East Central Europe and Eurasia
- 55.406 The Business Environment in East Central Europe and the Soviet Successor States
- 55.407 Social and Political Discourse in Russia
- 55.408 Nationalism and Ethnic Conflict in Eastern and Central Europe
- 55.410 Nation Building in Central and Eastern Europe
- 55.411 The Balkans
- 55.500, 55.501, 55.502, 55.503, 55.505, 55.507, 55.508, 55.510, 55.512, 55.513, 55.514, 55.514, 55.515, 55.516, 55.590, 55.591, 55.592, 55.593, 55.594, 55.595, 55.596

Other 400- and 500-level courses may be approved by graduate advisers as Institute of European and Russian Studies credits if they are deemed appropriate to a particular student's objectives.

## Academic Standing

Master's candidates must obtain a grade of B- or better on each credit counted towards the degree.

## Guidelines for Completion of Master's Degree

Students are normally expected to complete all requirements for the master's degree in four to six terms, although students entering the program with sufficient proficiency in Russian or German, or another approved language may complete the degree within one calendar year. Students participating in international exchanges will normally require longer to complete degree requirements.

## Diploma in European Integration Studies

This diploma program is only open to students currently enrolled in a graduate degree program at Carleton University and is intended to provide an additional qualification to the stu-

dent's main degree. Applications to the program should be made to the Institute of European and Russian Studies. Some previous coursework or practical experience in the field of European Studies is a prerequisite for admission to the program. The purpose of the diploma program is to supplement the student's program of study by providing in-depth study of processes of European integration from an interdisciplinary perspective and thus to prepare the student for professional work or further study in this field.

Students must complete 2.5 credits of coursework. No more than 1.5 of the course credits counted toward the student's main degree program can be counted toward the diploma program. In addition to English, the student must demonstrate proficiency in a second European language (approved languages are subject to the discretion of the Institute), as certified by a language examination.

### Required courses:

European and Russian Studies 55.503

*And at least two of the following:*

Political Science 47.554 Topics in West European Politics  
International Affairs 46.584 International Relations in Europe  
European and Russian Studies 55.512 The International Political Economy of Transition (also listed as International Affairs 46.582), 55.514 European Integration and European Security, 55.515 European Economic Integration, 55.516 Selected Topics in European Integration Studies

*And one additional credit which may include courses from the following:*

Economics 43.541 Public Economics: Expenditure, 43.542 Public Economics: Taxation, 43.561 International Trade: Theory and Policy, 43.562 International Monetary Theory and Policy, 43.586 Comparative Economic Systems I, 43.587 Comparative Economic Systems II  
Political Science 47.515 Post-Communist Politics in East Central Europe, 47.554 Topics in West European Politics, 47.559 Governing in the Global Economy, 47.587 Analysis of International Organizations, 47.588 International Political Economy  
International Affairs 46.538 International Trade: Theory and Policy, 46.539 International Finance: Theory and Policy

## Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

FW,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

European and Russian Studies 55.500F1

**Interdisciplinary Seminar I**

The theme of the seminar varies from year to year, but the continuing objective is to apply the approaches and methods of several relevant disciplines to selected themes and countries.

European and Russian Studies 55.501W1

**Interdisciplinary Seminar II**

Students should normally complete 55.500F1 before enrolling in this course. In addition to continued discussion of approaches and methods of several relevant disciplines, students will begin preparatory work on their master's research essays or theses.

European and Russian Studies 55.502F1 or W1  
**State-Society Relations in Transition**

The relationship between social forces and state structures at both the national and local levels in the USSR and the post-communist states. Also offered at the undergraduate level with different requirements as European and Russian Studies 55.402★, for which additional credit is precluded.

European and Russian Studies 55.503F1 or W1  
**Social and Political Perspectives in Europe**

The emergence of a European polity, identity and culture. Examination of whether "Europe" as a defined entity exists and the ways in which we may try to understand its evolution. Also offered at the undergraduate level with different requirements as European and Russian Studies 55.403★, for which additional credit is precluded.

Precludes additional credit for European and Russian Studies 55.400★ (taken 2000/01).

European and Russian Studies 55.505F1, W1  
**Environmental Problems and Politics in East/Central Europe and Eurasia**

Nature, origins and policy responses viewed from economic, political and geographic perspectives. Also offered at the undergraduate level, with different requirements, as European and Russian Studies 55.405★, for which additional credit is precluded.

Prerequisite: 1.0 credit in the area of East European or environmental studies, or permission of the Institute.

European and Russian Studies 55.507W1

**Social and Political Discourse in Russia**

Contemporary, social and political issues as covered in Russian-language media. Most course reading and instruction is in the Russian-language but student participation may be in English or Russian. Also offered at the undergraduate level, with different require-

ments, as European and Russian Studies 55.407★, for which additional credit is precluded.

Prerequisite: Appropriate facility in the Russian language and permission of the Institute.

European and Russian Studies 55.508F1, W1

**Nationalism and Ethnic Conflict in Eastern and Central Europe**

Ethnic basis of nationalism in the region. Ethnic politics and trends. Also offered at the undergraduate level, with different requirements, as European and Russian Studies 55.408★, for which additional credit is precluded.

European and Russian Studies 55.510F1, W1

**Nation-Building in Central and Eastern Europe**

Processes of nation-building in the region examined in terms of a particular country, or set of countries. Country focus may vary. Also offered at the undergraduate level, with different requirements, as European and Russian Studies 55.410★, for which additional credit is precluded.

European and Russian Studies 55.512F1 or W1

**The International Political Economy of Transition**

Problems of reintegration into the world economy and dilemmas of transition from command to market economies. Topics may include new trade and investment patterns, role in regional and international economic organizations, search for appropriate exchange rate policies, impact of Western assistance. (Also listed as International Affairs 46.582)

European and Russian Studies 55.513 F1 or W1

**Sustainability and Development in the Arctic: Transformations in the Circumpolar North**

The Circumpolar Arctic Region is undergoing rapid political, economic, social and technological development, which impacts sustainability. Climate, contaminants and biological diversity focus international attention. Nunavut, the Russian North, major developments, and international circumpolar regime formation will be discussed, with significant emphasis on environment and development. (Also listed as Geography 45.570)

European and Russian Studies 55.514F1 or W1

**European Integration and European Security**

A seminar focusing on security issues related to the formation of supra-national decision-making structures in Europe. Also offered at the undergraduate level with different requirements, as European and Russian Studies 55.414★, for which additional credit is precluded.

European and Russian Studies 55.515F1 or W1

**European Economic Integration**

A seminar focusing on economic issues and policies related to the process of European integration and the development of the European Union in the post-World War II period. Prerequisite: Economics 43.100.

European and Russian Studies 55.516F1, W1 or S1

**Selected Topics in European Integration Studies**

A seminar focusing on selected topics related to European integration in the post-World War II period.

European and Russian Studies 55.590F1

**Tutorial in Russian-Area Studies**

A course of directed readings on selected aspects of the Soviet successor states, involving preparation of papers as the basis for discussion with the tutor. Offered to meet specific program needs.

European and Russian Studies 55.591W1

**Tutorial in Russian-Area Studies**

European and Russian Studies 55.592S1

**Tutorial in Russian-Area Studies**

European and Russian Studies 55.593F1

**Tutorial in Central and East European Studies**

A course of directed readings on selected aspects of Eastern and Central Europe, involving preparation of papers as the basis for discussions with the tutor. Offered to meet specific program needs.

European and Russian Studies 55.594W1  
**Tutorial in Central and East European and Russian-Area Studies**

European and Russian Studies 55.595S1  
**Tutorial in Central/East European and Russian-Area Studies**

European and Russian Studies 55.596T2  
**Tutorial in Central/East European and Russian-Area Studies**

European and Russian Studies 55.598F2, W2, S2

**Research Essay**

A research essay on some topic relating to Central/East European and Russian-Area Studies

European and Russian Studies 55.599F4, W4, S4

**M.A. Thesis**

Other courses may be available at the University of Ottawa.

## Film Studies

St. Patrick's Building 423  
 Telephone: 520-2342  
 Fax: 520-3575  
 E-mail: filmgrad@carleton.ca

### The School

**Director,** Bryan Gillingham

**Supervisor of Graduate Studies,** George McKnight

The School for Studies in Art and Culture offers a program of study and research leading to the degree of Master of Arts in Film Studies. This is a disciplinary M.A. with emphasis upon 1) the conceptual issues current in the field, and 2) the problematics of various national cinemas and other practices.

The program will develop in students a broadly based expertise in the discipline. The study of Canadian cinema is given a high priority, but provision is also made for the study of other national cinemas, as well as for the study of other traditions outside the mainstream, such as women's cinemas, post-colonial cinemas, and minority and regional practices.

Most work in the program is on the feature fiction film and its institutional foundations as an object of study. However, in line with the expertise of members of faculty, the study of other film forms like documentary, animation, experimental film and video is a necessary part of the course offerings.

Questions of critical and historical method and problems of theory inform all of the courses in the program. This conceptual emphasis is in line with the central developments in Film Studies as a discipline over the past twenty-five years.

### Qualifying-Year Program

Applicants who lack an Honours degree, but who have a 3 year degree in Film Studies or a related discipline with a minimum standing of B+, may be admitted to a qualifying-year program. Students who complete the qualifying-year requirements with high honours standing or better will be considered for admission to the master's program. The regulations governing the qualifying-year are outlined in the general section of this calendar (see p.55).

## Master of Arts

### Admission Requirements

The minimum requirement for admission to the Master's program in either a full-time or part-time capacity is a B.A. (Honours) or the equivalent in Film Studies or a related discipline with high honours standing. Related disciplines might include Mass Communication, Art History, Literature, Canadian Studies, Women's Studies, and History. Applicants without a background in Film Studies may be required to take a maximum of two full credits from designated courses in the undergraduate Film Studies program in addition to their normal M.A. program requirements.

### Program Requirements

The specific program requirements for students in the M.A. program are as follows:

- \* 1.0 core credit required
- \* 2.0 additional credits
- \* Thesis (equivalent to 2.0 credits)
- \* Total of 5.0 credits required

In choosing the two additional credits beyond the core seminar and the thesis, students may take 0.5 credit outside the Film Studies program subject to the approval of the Graduate Supervisor.

Because of the strong conceptual demands of the program and the expectation that students be able to synthesize ideas in a substantial piece of written work, the research essay option will not be available in partial fulfillment of the requirements of the degree.

### Deadlines

Normally, full-time students should complete their course work by the end of the second term, and part-time students by the end of the fifth term.

### Thesis Proposal

Students will normally submit a detailed thesis proposal to the thesis proposal committee no later than March 1 of the first year of registration for students enrolled full-time and no later than the middle of the fifth term of registration for students enrolled part-time.

### Language Requirements

A reading knowledge of French (or another language approved by the Film Studies Graduate Supervisor) is required.

## Academic Standing

A standing of B- or better must be obtained in each course counted towards the master's degree.

## Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Film Studies 19.500T2

### Directions in Film Theory and Film History

This course is intended to acquaint students with recent developments in film theory and history. Topics may include spectatorship, identity, gender, cultural studies, fan cultures, performance, reception theory, formation of taste, discourse analysis, historical method, and concepts of national and transnational cinemas.

Film Studies 19.501F1, W1, S1

### Directed Readings and Research

Tutorials designed to permit students to pursue research on topics in Film Studies which have been chosen in consultation with members of faculty.

Film Studies 19.502F1 or W1

### Special Topics

This course offers selected topics in film studies not available in the regular course program.

Film Studies 19.515F1 or W1

### Changing Practices

This course looks at traditional and recent developments in non-feature film forms such as documentary, newsreel, experimental film, video and television. The aesthetic particulars, which distinguish these forms from the fiction feature film, and their social and cultural roles are examined.

Film Studies 19.521F1 or W1

### Topics in European Cinema

Some aspect of European cinema - a particular period, movement, style, genre, narrative development or co-production practice - is the focus of this course. Emphasis will be upon the problematic concept of a national cinema in the light of current debates about nation-ness

Film Studies 19.522F1 or W1

### Cinemas of the America

This course examines one or more of the cinemas of the United States, the Caribbean, Latin America and Brazil. A particular period, movement, style, genre, narrative development, some relationship between these cinemas or the problematic concept of a national cinema may be dealt with.

Film Studies 19.524F1 or W1

### Cultural Mediations

This course examines the processes of mediation that operate between mainstream and alternative, independent or marginal film industries and practices.

Film Studies 19.528F1 or W1

### Historical Traditions in Canadian Cinema

Selected aspects of the history of cinema in Canada are the focus of this course. Emphasis is placed upon the role that institutional bodies, government policies, economic decisions, aesthetic traditions, and related cultural practices have had on the history of Canadian cinema.

Film Studies 19.529F1 or W1

### Critical Perspectives on Canadian Cinema

This course examines current critical approaches to Canadian film. Attention will be given to the influence of Canadian and foreign cultural theory and criticism on film studies in Canada.

Film Studies 19.541F1 or W1

### Studies in Authorship

This course offers detailed attention to the work of one or two filmmakers, with a concern for recent ideas about the concept of authorship and the formation of artistic and critical reputations.

Film Studies 19.550F1 or W1

### Advanced Film Analysis

This course examines issues and approaches to the detailed analysis of particular film texts. Work in narratology, hermeneutics, discourse analysis, psychoanalysis, deconstruction and semiotics will provide the methodological background to the study of individual films.

Film Studies 19.551F1 or W1

### Gender and Cinema

The social production and reproduction of gender and gender relations through the cinema and its representations are examined in this course. The consequences of this work for feminist, gay and lesbian film practices and politics form an important part of the course.

Film Studies 19.561F1 or W1

### Studies in Genre

The theory and practice of film genres will be the object of study in this course.

Film Studies 19.571F1 or W1

**Topics in Animation**

Institutional histories, the work of individual animators, modes of production, and the social function of animation represent topics to be covered by this course.

Film Studies 19.590F1 or W1

**Cinema and Modernism**

This course examines cinema's relationship to the history and theory of modernism. The concerns of classical film theory, the emergence of avant-garde, modernist film practices, and film's relationship to other twentieth-century art forms represent areas of study in this course.

Film Studies 19.591F1 or W1

**Cinema and the Postmodern**

An examination of cinema's relationship to the history and theory of postmodern cultural practices in performance art, video, multimedia, architecture, literature, music, and other examples of artistic postmodernism is the focus of this course.

Film Studies 19.599

**M.A. Thesis**

## French

Dunton Tower 1602  
Telephone: 520-2168  
E-mail: french@carleton.ca

### The Department

**Chair of the Department, D. Rosse**

**Departmental Supervisor of Graduate Studies, C. Doutrelepon**

The program of studies leading to a Master of Arts degree in French offers to the student the opportunity to specialize in one of the following areas: linguistics, literature or translation. The availability of a variety of courses and the existence of 20.580, 20.597, 20.598, and 20.599, in which the student establishes course content in consultation with his/her adviser, allow for considerable flexibility and choice in wide ranging or highly specialized studies

### Qualifying-Year Program

Applicants who hold a general (3 year) bachelor's degree with at least B standing or higher, with a major in French, are required to register in the qualifying-year program (normally 5.0 credits in French chosen from those numbered at the 400-level), and maintain at least B+ standing overall, before proceeding to the M.A. program.

Qualifying-year students should consult the Undergraduate Calendar for a listing of 400-level courses.

### Master of Arts

#### Admission Requirements

The normal requirement for admission into the master's program is a B.A.(Honours) in French with at least high honours standing (normally B+ or better in Honours subject; B- or better overall).

#### Program Requirements

Students establish their programs in consultation with an adviser from the Department who will normally be the Supervisor of Graduate Studies or the professor with whom they take 20.597, 20.598, or 20.599.

The following three options are available:

\* 4.0 credits of which at least 3.0 credits must be chosen from courses at the 500-level; and an oral and written examination (Comprehensive) equivalent to 1.0 credit, in which the student demonstrates a good grasp of the tools and methods of scholarship, as well as competence in three chosen specialized areas,

\* 4.0 credits of which at least 3.0 credits must be chosen from courses at the 500-level; and a Research Essay equivalent to 1.0 credit (French 20.598), with an oral examination,

\* 3.0 credits of which at least 2.0 credits must be chosen from courses at the 500-level; and a master's thesis equivalent to 2.0 credits (French 20.599), with an oral examination.

With the approval of the supervisor of graduate studies, M.A. students in French may select the equivalent of 1.0 credit at the graduate or senior undergraduate level outside the 500-level courses offered by the Department.

### Guidelines for Completion of Master's Degree

Normally, all full-time students are expected to fulfill the requirements of the M.A. program by the end of the fifth term of study. Generally, students should be able to complete their program within four terms.

Students are required to file with the Department of French a detailed proposal of their thesis, research essay or comprehensive exam. Full-time master's candidates are required to submit this proposal by the end of the ninth month of full-time registration.

### Academic Standing

A grade of B- or better must be obtained in each credit counted towards the master's degree.

### Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

The graduate courses offered by the Department are open to students in the M.A. program and, with permission of the Department, to students in the qualifying-year program. For prerequisites, please consult the Department.

French 20.501F1 or W1

**Théories linguistiques francaises**

Topic may vary from year to year.

French 20.502F1 or W1

**Linguistique du français I**

Topic may vary from year to year.

French 20.503F1 or W1

**Linguistique du français II**

Topic may vary from year to year

French 20.504 W1

**Linguistique du français canadien**

Problèmes de sémantique et de lexicologie en français canadien. Discussion d'articles portant sur le lexique. Étude de dictionnaires et de glossaires. Classement étymologique, stylistique et normatif des éléments du lexique. Analyse de corpus oraux et écrits.

French 20.506 F1 or W1

**Linguistique du français langue seconde**

Topic may vary from year to year.

French 20.507F1

**Traduction: théorie et pratique**

Poésie et traduction. Après une introduction théorique, définitions générales, traduction de la métaphore, des jeux de mots, traduction féministe, les exercices pratiques porteront sur la traduction en français de textes de poètes canadiens-anglais et anglophones et en anglais de textes de poètes québécois et francophones.

French 20.520F1

**Aspect linguistique particulier**

Les langues françaises. La linguistique historique comparative classe les langues du monde en familles: parmi les langues indo-européennes, le latin a donné naissance aux langues romanes, parmi lesquelles le français donne naissance, à son tour, sous nos yeux presque, à une nouvelle famille: les langues françaises. Also offered at the undergraduate level, with different requirements, as French 20.480, for which additional credit is precluded.

French 20.520W1

**Aspect linguistique particulier**

Le plurilinguisme et l'être interculturel. Définitions de culture; relations de langue(s) et de culture(s); passage du bilinguisme (biculturalisme) au plurilinguisme (pluriculturel); notions d'identité par la différenciation; de «narratifs» culturels, d'état civique, d'appartenance et de citoyenneté; relations avec l'apprentissage et la didactique des langues. Comment être interculturel? Also offered at the undergraduate level, with different requirements, as French 20.480, for which additional credit is precluded.

French 20.541F1 or W1

**Sémiotique littéraire**

Topic may vary from year to year.

French 20.542F1 or W1

**Littérature et rhétorique**

Topic may vary from year to year.

French 20.543F1 or W1

**Littérature et idéologie**

Topic may vary from year to year.

French 20.544W1

**Auteurs I**

Victor Hugo et l'épopée littéraire française: La Légende des siècles est un ensemble de poèmes épiques, si l'on tient compte surtout de son caractère narratif; mais c'est aussi une oeuvre philosophique, organisée selon une idée morale: les progrès de la conscience humaine.

French 20.545F1 or W1

**Thèmes, écoles, mouvements**

Topic may vary from year to year.

French 20.546F1

**Genres I**

Étude d'autobiographies, de fictions autobiographiques et de journaux intimes à la lumière des théories de l'autobiographie narratives, féministes et postcoloniales. Choix de textes de Henriette Dessaulles, Gabrielle Roy, Michel Tremblay, Alain Robbe-Grillet, Roland Barthes, Nathalie Sarraute, Marguerite Duras, Marie Cardinal, Maryse Condé.

French 20.547F1

**Genres II**

Le roman français contemporain. Réflexion sur la forme romanesque, écriture, structure, thèmes par l'étude de cinq romans français publiés au cours des vingt dernières années. On entend beaucoup dire ces temps-ci qu'il n'y a plus d'écrivains en France. Ce cours tentera de questionner ce mythe.

French 20.547W1

**Genres II**

Les théâtres francophones: mise en texte de la «diversalité». Les multiples théâtres francophones contribuent à l'élaboration des discours identitaires fort divers. Notre objet d'étude: les pratiques textuelles et scéniques du Québec (René Daniel Dubois), de la Martinique (Aimé Césaire) et de la Guadeloupe (Maryse Condé).

French 20.548F1 or W1

**Littérature française I**

Topic may vary from year to year.

French 20.549F1 or W1

**Littérature française II**

Topic may vary from year to year.

French 20.550W1

**Littérature canadienne-française I**

Thèmes, mythes et symboles dans l'oeuvre d'Yves Thériault. Analyse de la représentation des Amérindiens, des Inuits, des minorités culturelles et des exclus sociaux. Étude des mythes de la folie et de la sexualité. Analyse du symbole de la nature et de la signification des lieux dans dix romans.

French 20.551F1 or W1

**Littérature canadienne-française II**

Topic may vary from year to year.

French 20.561F1 or W1

**Sémiotique culturelle**

Topic may vary from year to year.

French 20.562F1 or W1

**Littérature, société, communication**

Topic may vary from year to year.

French 20.563F1

**Littérature et les autres arts**

Correspondances. Rencontre de la littérature et de la musique. Analyse de textes littéraires qui sont à la base d'opéras; leur transformation par les librettistes et les musiciens; correspondances entre les formes d'expression artistique. Auteurs: Molière, Beaumarchais, Mérimée, Murger, Dumas, Hugo, Sardou, Voltaire, Maeterlinck. Compositeurs de Mozart à Bernstein.

French 20.564F1 or W1

**Paralittératures**

Topic may vary from year to year.

French 20.570F1 or W1

**Aspect littéraire culturel particulier**

Topic may vary from year to year.

French 20.580F1, W1, S1

**Cours de lectures dirigées**

Sujet établi sur proposition de l'étudiant en consultation avec son conseiller.

French 20.597F2, W2, S2

**Comprehensive Examination**

French 20.598F2, W2, S2

**Mémoire de recherche**

Tout(e) étudiant(e) qui ne fait pas de thèse, choisira un directeur d'études avec qui il/elle préparera un mémoire d'une cinquantaine de pages sur un sujet de son choix. Ce travail sera sanctionné par un examen oral.

French 20.599F4, W4, S4

**M.A. Thesis**

# Geography

Loeb Building B349  
Telephone: 520-2561  
Fax: 520-4301

## The Department

**Chair of the Department,** J. Kenneth Torrance

**Departmental Supervisor of Graduate Studies,** D.R. Fraser Taylor

The Department of Geography and Environmental Studies offers programs of study and research in human and physical geography leading to the degrees of Master of Arts and Doctor of Philosophy. Doctoral studies in physical geography may be undertaken in cooperation with the Ottawa-Carleton Geoscience Centre.

Students are accepted into the graduate program based on the standard of previous academic work, research interests, letters of reference, and the availability of faculty to act as supervisors. Each student's program of study, as far as possible, is based on the interests of the individual, although certain courses may be required. An advisory committee, consisting of the student's research supervisor and at least one other member of the faculty, is established to monitor progress and provide thesis research guidance.

Excellent research laboratory facilities exist for the geotechnical study of near surface processes, and the physics, chemistry, and thermodynamics of earth materials, as well as for computer cartography and for remote sensing. These facilities are supported by a highly qualified full-time staff in laboratory instrumentation, cartography, and computing. There is a specialized Map Library in the geography building. The university's location in Canada's capital city offers students access to important federal resources, such as the National Library, the Public Archives of Canada, the Canada Centre for Remote Sensing, Statistics Canada, and the specialist libraries of many government departments.

Systematic interests of Departmental members are applied to a variety of world regions, although emphasis is given to Canada (including northern studies) and the Third World (especially Africa). The main clusters of specialization within the Department are the following:

*Physical Geography and Geotechnical Science*  
Studies of natural processes close to the earth's surface and their geotechnical significance; climate-ground interaction; geocryology; chemical, physical, and thermodynamic characteristics of soils and sediments; hydrology. (C.R. Burn, N.C. Doubleday, Joyce Lundberg, M.W. Smith, J.K. Torrance)

## Resource Development

Identification and analysis of development processes; the interplay of environmental, demographic, social, gender, political, and economic variables in the spatial development of land resources, settlement systems, outdoor recreation, tourism, and natural resource-based industries; environmental impact assessment and environmental management. Canadian and Third World development is stressed. (R.D. Bollman, M.J. Brklacich, John Clarke, M.F. Fox, A.F.D. Mackenzie, E.W. Manning, G.I. Ozornoy, M.W. Smith, D.R.F. Taylor, J.K. Torrance, A.I. Wallace)

## Cultural, Historical, and Political Geography

Rural and urban settlement history; ethnicity; territorial organization and the concepts of state, group politico-territorial identities, territoriality, and self-determination; role of territory in conflict situations; perceptions of environment and geographies of the mind; gender as a cultural variable; urban heritage conservation. (John Clarke, Simon Dalby, N.C. Doubleday, Fran Klodawsky, V.A. Konrad, E.J. Marshall, D.R.F. Taylor, I.C. Taylor, John Tunbridge)

## Social and Economic Geography

Geographical analyses of the social and economic organization of societies; area variations in social well-being; medical geography; provision of public and informal services in changing local and regional environments; implications of gender roles for environmental restructuring; industrial systems; philosophy of science and of geography. (David Bennett, Simon Dalby, Fran Klodawsky, A.F.D. Mackenzie, E.J. Marshall, G.I. Ozornoy, A.N. Spector, A.I. Wallace)

## Computer Cartography and Remote Sensing

Development of applications in computer cartography and the use of remote sensing in geographical research. (M.F. Fox, D.J. King, D.R.F. Taylor)

## Qualifying-Year Program

Applicants with exceptional promise who have a general (3 year) bachelor's degree, or who have substantially less than the Honours B.A. in Geography, may be admitted to a qualifying-year program. To be considered for admission into the master's program, qualifying-year students must attain at least an overall high honours standing in their qualifying-year geography courses. The General Regulations section of this Calendar provides details about the regulations governing the qualifying year (see p.55.)

## Master of Arts

### Admission Requirements

The normal requirement for admission into the master's program is a B.A.(Honours) or B.Sc.(Honours) in Geography, with at least high honours standing. In exceptional cases, pertinent work experience may be considered in support of an application to the Department. Applicants who have taken their undergraduate degree in the physical or natural sciences or engineering, as well as in physical geography, will be considered if their research interests coincide with those of the Department. Applicants in human geography may be accepted from related fields if their proposed research is closely related to faculty research experience. Students with academic deficiencies may be required to take additional courses.

### Program Requirements

The M.A. in Geography normally takes from twelve to eighteen months, but field work may necessitate some extension. All master's students in geography are required to complete a minimum of 5.0 credits, including an M.A. thesis which must be successfully defended at an oral examination. All students are required to have a reading knowledge of the language considered essential to their research.

In addition to the formal requirements, M.A. students will normally be required to attend a Research Proposal Workshop and the Departmental Seminar series.

## Doctor of Philosophy

The doctoral program in geography is structured around two fields:

- \* the geography of societal change with emphasis on the global political economy; restructuring and the environment; geographies of socio-cultural evaluation; feminist geographies
- \* the geography of environmental change with emphasis on environmental processes and anthropogenic impacts; appraisal and societal management of environmental resources

Students in each field are required to complete 45.600/45.601 which addresses substantive and methodological issues arising out of the interactions of social and environmental systems. Every student's thesis committee will include at least one faculty member from the field other than the chosen field.

### Admission Requirements

The normal requirement for admission to the Ph.D. program is a master's degree (or the equivalent) in geography, with at least an A-average. A student already registered in the

M.A. program who shows outstanding academic performance and research promise may be permitted to transfer to the Ph.D. program with a recommendation by the Departmental graduate committee.

Applicants whose academic preparation has deficiencies in certain areas may be admitted to the Ph.D. program with the requirement that they complete additional course work.

Admission to the Ph.D. program is granted on a full-time basis in September for the Fall term. In exceptional cases, a part-time program may be considered.

### Program Requirements

Program requirements for the Ph.D. degree are outlined in the General Regulations section of this Calendar (see p.55.) The specific program requirements of the Department of Geography and Environmental Studies are:

- \* 10.0 credits
- \* Geography 45.600/45.601
- \* *Either* Geography 45.603/45.604 *or* Geography 45.606/45.607
- \* Two written comprehensive examinations including Geography 45.695 and *either* Geography 45.696 *or* Geography 45.697
- \* Presentation and oral defence of the thesis proposal as outlined below
- \* Language requirement as outlined below
- \* A thesis equivalent to 8.0 of the required 10.0 credits which must be defended at an oral examination

### Comprehensive Examinations

Each doctoral candidate is required to write two comprehensive examinations:

- \* Geography 45.695
- \* One other examination in the chosen field of specialization

The comprehensive examinations must be completed after course requirements for the Ph.D. have been completed. Normally this will be the end of the third semester, but must be no later than the end of the fall semester of the second year of registration in the Ph.D. program.

### Thesis Proposal

Candidates normally register in the thesis on entry to the program and work actively to define their research topic during the first term of registration. The thesis proposal must be presented after comprehensive requirements have been fulfilled. Candidates normally submit and defend the thesis proposal at an oral examination no later than the end of the fourth term of

registration in the Ph.D. program. Continuous registration is required after initial registration in the thesis.

## Language Requirement

All Ph.D. candidates are required to demonstrate an ability to comprehend geographical literature in a language other than English. This will normally be satisfied in the context of course work for the core and field seminars. The other language will normally be French, but may be an alternative pertinent to their research, as recommended by the thesis committee. Fluency in a second language required to undertake field research may be substituted as a fulfillment of this requirement.

## Residence Requirements

All Ph.D. candidates must be registered full time in a minimum of six terms to satisfy the residence requirement.

## Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

In addition to the selection of courses offered by the Department, graduate students in geography are encouraged to consider, in partial fulfillment of their degree requirements, appropriate courses offered in such disciplines as biology, chemistry, economics, engineering, geology, history, international affairs, physics, political science, and sociology.

Courses at the University of Ottawa may also be taken for credit in a Carleton M.A. program; permission of the Departments in both universities is required.

Geography 45.500F1

### Approaches to Geographical Enquiry

A review of the major philosophical perspectives shaping research and explanation by geographers. Particular attention is paid to interpretations of social structure and human action, the nature of the biophysical universe, and the interaction between human beings and their environments.

Geography 45.501F1,W1

### Modelling Environmental Systems

An introductory seminar in methods and problems of research on the physical environment. With illustrative material taken mostly from the

atmospheric and surface earth sciences, issues such as the identification and behaviour of environmental systems, temporal and spatial scale, experimental method under field conditions, and simulation and model development are considered.

Geography 45.505W1

### Global Environmental Change: Human Implications

Global environmental change: its significance for societies, economies and international relations. Value systems underlying environmental discourse; political economy of the environment; sustainability and security. Environmental diplomacy and grassroots environmentalism. Regionalized impacts of pressures on natural environments; challenges of adaptation. (Also listed as International Affairs 46.571)

Geography 45.517F1, W1, S1

### Field Study and Methodological Research

Field acquisition and analysis of geographic material; supervised field observations and methodology. (Individual or group basis, by special arrangement).

Geography 45.520F1

### Issues in Development in Africa

Analysis of structures and processes of political, social, and economic change in intertropical Africa at scales ranging from the intrahousehold and local community to the state and international system. An objective is to integrate gender and the environment into analyses which draw on theories of political economy. (Also listed as International Affairs 46.563)

Geography 45.530F1

### Soil Thermal and Hydrologic Regimes

Characteristics of soil regimes, particularly in freezing soils; role of soil properties; analytical and numerical methods, including computer simulation. (Alternates with Geography 45.532)

Geography 45.533W1

### Geocryology

Development of ground ice in permafrost regions of Canada; ice segregation and pore-water expulsion during ground freezing; analytical and numerical approaches to modelling permafrost conditions.

Prerequisite: Geography 45.418 or permission of the Department.

Geography 45.534F1

### Aspects of Clay Mineralogy and Soil Chemistry

The role of clay minerals in soils will be considered from a geotechnical and/or biological perspective.

Geography 45.537W1

### Soil Resources

The properties of soils, development, classification, productive potential, and management problems of the world's soils. Primary emphasis

sis will be agricultural, but environmental and geotechnical aspects will be considered.

Geography 45.540F1

**Territory and Territoriality**

Contemporary geographical and international relations theorizing is challenging notions of boundaries and territories in the political organization of modernity. Using contemporary writings on geopolitics, security, sovereignty, self-determination and identity politics this course investigates territoriality as a political and intellectual strategy. (Also listed as International Affairs 46.542)

Geography 45.541F1

**Society and Space**

Analysis of geographers' contributions to contemporary social theory and of the geographical significance of theoretical debates in related fields.

Geography 45.542F1

**Selected Concepts in Social Geography**

Theme to be announced.

Geography 45.543F1

**Selected Concepts in Cultural Geography**

Investigation of a substantive theme in cultural geography. Theme to be announced.

Geography 45.544W1

**Gender and Environments**

This course examines the relation between gender role change and the creation and use of environments. Changes in people's activities, in the first and third worlds, are assessed in the context of feminist analyses. Conceptual and methodological skills for gender-sensitive research are developed. Subsequent directed field experience may be achieved by taking 45.517.

Geography 45.545W1

**Problems in Historical Geography**

Philosophical and methodological approaches in geography, history, and historical geography, emphasizing the use of primary documents, model building, and statistical methods as they relate to the historical geography of Canada. Also offered at the undergraduate level, with different requirements, as Geography 45.435, for which additional credit is excluded.

Geography 45.550F1

**Globalization and Localities**

A review of recent theoretical and methodological debate in this field and analysis of the changing geography of production, employment, and social consumption in advanced economies. Policy issues will be considered.

Geography 45.555W1

**Tourism Development**

The nature of tourist development in various parts of the world, with special emphasis on its cultural and economic implications.

Geography 45.558W1

**Agribusiness North and South**

Analysis of the transformation of agriculture into an integrated multi-sectoral food production system and of its theoretical implications. Focus on the growth and strategies of agribusiness institutions in advanced industrial societies and on their penetration into, and impact upon, Third World economies. (Also listed as International Affairs 46.534)

Geography 45.570W1

**Sustainability and Development in the Arctic: Transformation in the Circumpolar North**

The Circumpolar Arctic Region is undergoing rapid political, economic, social and technological development, which impacts sustainability. Climate, contaminants and biological diversity focus international attention, Nunavut, the Russian North, major developments, and international circumpolar regime formation will be discussed, with significant emphasis on environment and development.

Geography 45.572W1

**Issues in Canadian Resource Development**

The economic, environmental, and social challenges facing Canadian resource-based industries and the communities they support. Focus on the agricultural, energy, forest, and mineral sectors. The global and national contexts of the political economy of production, marketing, and resource management are reviewed.

Geography 45.573F1, W1

**Natural and Regional Resource Analysis**

A review and critical appraisal of selected methods for natural and regional resource analysis such as plan evaluation methods, input-output models, resource optimization models, natural resource accounting, and ecological economics.

Geography 45.580W1

**Spatial Information Systems**

Advanced concepts and problems involved with spatial information systems, especially those with a mapping component.

Geography 45.583W1

**Remote Sensing and Image Analysis**

Radiometric, geometric, and resolution characteristics of remotely sensed data; image processing algorithms; analysis of spectral, textural, and contextual image information; applications to vegetation mapping and environmental analysis.

Geography 45.584F1

**Introduction to Geographic Information Systems**

Introduction to geographical application of GIS for students with no previous experience. Includes benefits and limitations of GIS, data formats and structures, input/output capabilities, analysis functions, and applications.

Geography 45.590F1, W1, S1

**Graduate Tutorial**

Tutorial, directed reading or research, offered on an individual basis, to meet specific program needs; may be taken in one of the areas of specialization of the Department.

Geography 45.599F4, W4, S4

**M.A. Thesis**

Thesis supervision will be given in all areas of specialization of the Department, as listed on p. 191.

\* 600-level courses are open only to students registered in the doctoral program.

Geography 45.600F1, 45.601W1

**Doctoral Core Seminar: Geography, Society and the Environment**

Geographical perspectives on the development of society/environment interrelations in Western thought and critiques thereof. The course is taught by faculty representing the two fields of the program, the geography of social change and the geography of environmental change.

Geography 45.603F1, 45.604W1

**Field Seminar: Geography of Societal Change**

Analysis of current geographical and related research into the three themes of global political economy: restructuring and the environment; geographies of socio-cultural evaluation; and feminist geographies.

Geography 45.606F1, 45.607W1

**Field Seminar: Geography of Environmental Change**

Analysis of geographical and related research into the appraisal and societal management of environmental resources, and environmental processes and anthropogenic impacts.

Geography 45.695F1, W1, S1

**Comprehensive Examination: Geography, Society and the Environment**

This examination involves a general knowledge of geographical perspectives on the development of society/environment interrelations in Western thought and critiques thereof. A specific theme will be identified for each candidate. Evaluation is: *Pass, Pass with Distinction, Fail.*

Geography 45.696F1, W1, S1

**Comprehensive Examination: The Geography of Societal Change**

This examination focuses on research challenges in theory and methodology in the themes of global political economy: restructuring and the environment; geographies of socio-cultural evaluation; feminist geographies. A specific theme will be identified for each candidate. Evaluation is: *Pass, Pass with Distinction, Fail.*

Geography 45.697F1, W1, S1

**Comprehensive Examination: The Geography of Environmental Change**

This examination focuses on research challenges in theory and methodology associated with the appraisal and societal management of environmental resources, and environmental processes and anthropogenic impacts. A specific theme will be identified for each candidate. Evaluation is: *Pass, Pass with Distinction, Fail.*

Geography 45.699F, W, S

**Ph.D. Thesis**

# The Ottawa-Carleton Geoscience Centre

Université d'Ottawa  
University of Ottawa



Carleton University

Herzberg Building 2240

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E-mail: earth\_sciences@carleton.ca

## The Centre

**Director of the Centre,** John Blenkinsop

Established in 1982, the Ottawa-Carleton Geoscience Centre, a joint initiative of Carleton University and the University of Ottawa, offers programs leading to the degrees of M.Sc. and Ph.D. in most areas of geoscience. The Centre houses modern instrumental facilities, and research activity includes most areas of the Earth Sciences.

The size of the Centre and its location in the nation's capital offer unique opportunities for collaborative research over a broad range of disciplines. Of particular note is the Centre's close collaboration with the Geological Survey of Canada. The campuses are fifteen minutes apart by complimentary inter-university transport and within a short distance of most federal facilities.

Graduate students are enrolled in the university where their faculty supervisors hold appointments. Students draw from a program of courses in English or French and may pursue their research in either language.

Applications for graduate admission are made to the Director of the Centre.

The research interests of members of the Centre are listed below.

## Members of the Centre

The home department of each member is indicated by (CU) for the Department of Earth Sciences, Carleton University; (UO) for the Department of Earth Sciences, University of Ottawa; (CE) for the Department of Civil Engineering, Carleton University; (PHY) for the Department of Physics, University of Ottawa; (GEOGCU) for the Department of Geography and Environmental Studies at Carleton University; (GEOGUO) for the Department of Geography at the University of Ottawa.

- F.P. Agterberg, *Geomathematics, Evaluation of Nonrenewable Resources, Automated Stratigraphic Correlation* (UO-Adjunct)
- R.W. Arnott, *Clastic Sedimentology, Experimental Sedimentology* (UO)

- I. Asudeh, *Seismology and Instrumentation* (CU-Adjunct)
- G.M. Atkinson, *Engineering Seismology, Strong Ground Motion, Seismic Hazard* (CU)
- A. Bannari, *Remote Sensing and Geographic Information Systems* (GEOGUO)
- G.E. Bauer, *Geotechnical Engineering, Groundwater Flow, Soil Mechanics* (CE)
- Keith Bell, *Isotope Studies, Petrology of Alkaline Rocks and Carbonatites, Geochronology* (CU)
- Keith Benn, *Structural Geology, Structural Petrology, Anisotropy of Magnetic Susceptibility, Basement Tectonics* (UO)
- R.G. Berman, *Metamorphic Petrology, Experimental Petrology* (CU-Adjunct)
- John Blenkinsop, *Mass Spectrometry, Geochronology, Isotope Geochemistry* (CU)
- G.F. Bonham-Carter, *Spatial Information Systems, Spatial Data Modelling* (UO-Adjunct)
- R.L. Brown, *Tectonics and Structural Geology* (CU)
- C.R. Burn, *Permafrost and Ground Ice, Yukon and Western Arctic* (GEOGCU)
- M.W. Caldwell, *Vertebrate Paleontology, Evolution, Systematics* (CU-Adjunct)
- E.M. Cameron, *Precambrian Geochemistry, Genesis of Gold Deposits, Exploration Geochemistry* (UO-Adjunct)
- S.D. Carr, *Cordilleran and Grenville Tectonics, U-Pb Geochronology* (CU)
- I.D. Clark, *Hydrogeology, Environmental Isotope Geochemistry* (UO)
- B.L. Cousens, *Igneous Petrology; Isotope Geochemistry* (CU-Adjunct)
- S.L. Cumbaa, *Vertebrate Paleontology and Paleoecology* (CU-Adjunct)
- W.J. Davis, *U-Pb geochronology, isotope geochemistry; Precambrian Lithospheric evolution* (CU-Adjunct)
- André Desrochers, *Carbonate Sedimentology and Diagenesis, Canadian Arctic* (UO)
- M. D'Orio, *Remote Sensing; Radar Geology; Geostatics* (UO-Adjunct)
- G.R. Dix, *Sedimentology and Stratigraphy, Emphasis on Modern and Ancient Carbonate Settings* (CU)
- O.A. Dixon, *Invertebrate Paleontology, Stratigraphy, Canadian Arctic* (UO-Adjunct)
- J.A. Donaldson, *Precambrian Stratigraphy and Sedimentology* (CU-Adjunct)

- R.M. Easton, *Grenville and Proterozoic geology, physical volcanology, geochemistry* (CU-Adjunct)
- Danielle Fortin, *Geomicrobiology; Environmental Geochemistry* (OU)
- A.D. Fowler, *Geochemistry, Archean Metavolcanic Belts, Non-linear Dynamics* (UO)
- H.M. French, *Permafrost and Periglacial Phenomena* (UO)
- William K. Fyson, *Structural Analyses in Metamorphic Terrains* (OU-Adjunct)
- Konrad Gajewski, *Climatology and Climatic Changes: Quaternary Paleoecology* (GEOGUO)
- Marie-Anne Geurts, *Palynology and Geomorphology, Travertine* (GEOGUO)
- H.J. Gibson, *Subaqueous Volcanic Processes and Metallic Mineral Deposits* (CU-Adjunct)
- W.D. Goodfellow, *Geochemistry of Modern and Ancient Sediment-hosted Deposits, Mass Extinction* (UO-Adjunct)
- S.K. Hanmer, *Shear Zones, Progressive Strain, Grenville Problems* (CU-Adjunct)
- M.D. Hannington, *Economic Geology, Mineral Deposits* (CU-Adjunct)
- K.H. Hattori, *Isotope Geochemistry, Mineral Deposits, Archean Geology* (UO)
- Donald D. Hogarth, *Mineralogy; Igneous and Metamorphic Petrology; Alkaline Rocks* (OU-Adjunct)
- P.G. Johnson, *Glacial Geomorphology, Slope Mass Movements, Glacier Hydrology* (GEOGUO)
- A.G. Jones, *Magnetotellurics* (CU-Adjunct)
- D.J. King, *Remote Sensing, Vegetation Damage Assessment including Geobotanical Techniques, Geographic Information Systems* (GEOGCU)
- Thomas Kotzer, *Environmental Isotope Geochemistry; Hydrogeology; Radioisotopes* (OU- Adjunct)
- Ralph Kretz, *Mineral Chemistry, Metamorphism, Environmental Studies* (UO-Adjunct)
- Jarmila Kukalova-Peck, *Paleontology, Fossil Insects* (CU-Adjunct)
- A.E. Lalonde, *Petrology and Mineralogy of Plutonic Rocks* (UO)
- M. Lamontagne, *Intraplate Seismicity* (CU-Adjunct)
- Bernard Lauriol, *Geomorphology* (GEOGUO)
- D.A. Leckie, *Clastic Sedimentology, Sequence Stratigraphy, Basin Analysis* (CU-Adjunct)
- A.G. Lewkowicz, *Permafrost Geomorphology, Hydrogeology, Effect of Global Change on Arctic Terrain* (GEOGUO)
- Yvan L'Heureux, *Non-linear Dynamics; Crystal Growth Modelling* (PHY)
- Joyce Lundberg, *Karst, Quaternary Studies, Geochronology* (GEOGCU)
- Andrew M. McDonald, *Mineral of hyperalkaline rocks: Crystal chemistry; Sulfide mineralogy* (UO-Adjunct)
- F.A. Michel, *Isotope Geochemistry, Groundwater and Permafrost Studies* (CU)
- R.T. Patterson, *Micropaleontology Specializing in Foraminifera* (CU)
- J.A. Percival, *Igneous and Metamorphic Petrology, Geochemistry, Structural Geology, Geochronology* (UO-Adjunct)
- R.H. Rainbird, *Precambrian Sedimentology and Stratigraphy* (CU-Adjunct)
- Giorgio Ranalli, *Rheology of the Earth, Geodynamics, Plate Tectonics* (CU)
- D.G. Rancourt, *Mössbauer Spectrometry, Mineralogy, Geobarometry, Geothermometry, Micas* (PHY)
- M.R. Robin, *Contaminant Hydrogeology, Geostatistics, Geomathematics* (UO)
- W.R. Roest, *Global Plate Tectonics, Potential Fields, Regional Geophysical Compilations, Continental Margin Development, Arctic Ocean and Adjacent Land Areas* (UO-Adjunct)
- C.J. Schröder-Adams, *Micropaleontology, Biostratigraphy, Paleoecology, Foraminifera, Sequence Stratigraphy* (CU)
- G.B. Skippen, *Metamorphic Petrology, Aqueous Geochemistry* (CU)
- M.W. Smith, *Permafrost, Microclimate, Soil Freezing* (GEOGCU)
- R. Stern, *U-Pb-Th Geochronology; Secondary Ion Mass Spectrometry; Trace Element Geochemistry* (CU-Adjunct)
- R.P. Taylor, *Igneous Petrology, Mineral Deposits* (CU)
- J.K. Torrance, *Soil Chemistry, Clays, Oxide Minerals and Geotechnical Problems* (GEOGCU)
- Cees van Staal, *Sedimentary and Metamorphic Terranes in Europe and North America and Tectonic Evolution of the Appalachian Orogen* (UO- Adjunct)
- Jan Veizer, *Sedimentary Geochemistry, Carbonates, Diagenesis, Ores, Precambrian Sedimentology* (UO)

- D.H. Watkinson, *Metallic Mineral Deposits* (CU)
- P.J. Williams, *Soil Freezing and Geotechnical Problems, Cold Region Pipelines* (GEOGCU-Adjunct)

## Master of Science

### Admission Requirements

The normal requirement for admission to the program is an Honours B.Sc. degree, with at least high honours standing, in geology or a related discipline.

### Program Requirements

- \* A research thesis defended at an oral examination
- \* The equivalent of 2.0 credits, one of which may be at the senior undergraduate level
- \* Public lecture on thesis results prior to the thesis examination

### Academic Standing

A grade of B- or better must normally be received in each course counted towards the Master's degree.

## Doctor of Philosophy

### Admission Requirements

The normal requirement for admission to the Ph.D. Program is an M.Sc. degree in Earth Sciences or a related discipline.

Students who show outstanding academic performance and research promise may be permitted to transfer to the Ph.D. program. A student requesting such a transfer must first successfully complete the Ph.D. comprehensive examination and the M.Sc. course requirements.

### Program Requirements

- \* A research thesis defended orally before an examination board which includes an external examiner
- \* A comprehensive examination to include presentation of a thesis proposal and three areas chosen by the student's advisory committee and approved by the Director of the Ottawa-Carleton Geoscience Centre
- \* A minimum of 1.0 credit at the graduate level. Additional courses may be prescribed by the thesis advisory committee
- \* Public lecture on thesis results prior to the thesis examination

## Residence Requirement

The normal residence requirement for the Ph.D. degree is at least four terms of full-time study.

## Guidelines for Completion of Master's and Doctoral Degrees

Full-time students enrolled in the 5.0 credit M.Sc. program are expected to complete the program by the end of six terms, and part-time students by the end of six years. A thesis proposal and selection of the thesis committee should be completed by the end of the second term for both Ph.D. and M.Sc. students.

Full-time students enrolled in the 10.0 credit Ph.D. program are expected to complete the program by the end of four years, and part-time students by the end of eight years, with the opportunity for extensions upon the recommendation of the supervisor and departmental supervisor of graduate studies. A comprehensive examination for Ph.D. students must be completed by the end of the first year.

## Directed Studies Courses

Directed studies courses are not permitted as credit toward the graduate degree requirements. Such courses may be taken as extra to the minimum requirements for the M.Sc. or Ph.D. degrees.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

Geology 67.501 (GEO5101)

### Seminars in Earth Sciences I

One-term modular courses covering a spectrum of Earth Science topics and current research problems, ranging from the geology and geophysics of the solid Earth, to its surface environment and crustal resources. A minimum of four modules offered per term, three must be completed to obtain course credit. Students may not normally take a module for credit that is offered by their supervisor, but may do so with the permission of the Director. Choice of modules must be approved by the Centre Director. Course complements Geology 67.502.

Geology 67.502 (GEO5102)

### Seminars in Earth Sciences II

One-term modular courses covering a spectrum of Earth Science topics and current research problems, ranging from the geology and geophysics of the solid Earth, to its surface environment and crustal resources. A minimum of four modules offered per term, three must

be completed to obtain course credit. Students may not normally take a module for credit that is offered by their supervisor, but may do so with the permission of the Director. Choice of modules must be approved by the Centre Director. Course complements Geology 67.501.

Geology 67.514 (GEO 5114)

### **Mineralogy**

An advanced course covering selected topics in mineralogy, such as crystallography, crystal chemistry, crystal structure, mineralogy of rock-forming mineral groups, and instrumental methods in mineralogical research, such as use of electronic optical instruments, spectroscopy, and X-ray crystallography; seminar presentations and practical exercises included.

Geology 67.521 (GEO5121)

### **Igneous Petrogenesis**

Concentration on one or more of: origin and differentiation of basaltic magma; origin of granites; computer modelling of partial melting and fractional crystallization; magmatism in time and space, physical processes in igneous petrology. Laboratory and lecture material linked together in project form. (Also listed as GEO5721)

Geology 67.521 (GEO5721)

### **Pétrogenèse Ignée**

Un cours basé sur un (ou plusieurs) des thèmes suivants: origine et différenciation de magma basaltique; origine de granites; simulation par ordinateur de fusion partielle et cristallisation fractionnée; magmatisme en temps et en espace. Laboratoire et cours qui s'enchainent sous forme d'un projet.

Geology 67.522 (GEO5122)

### **Physical Volcanology**

The distribution, classification and physical characteristics of volcanos and other volcanic landforms; lava flows, tephra, breccias, and other rocks formed through volcanic activity. Volcanic environments; recognition of ancient volcanic features; case histories.

Geology 67.523 (GEO5123)

### **Metamorphic Petrology**

Thermodynamics and kinetics of mineral reactions; metamorphic zones and isograds; mass transfer; regional and global aspects of metamorphism.

Geology 67.524 (GEO5124)

### **Mineral Deposits**

Relationships of some metallic mineral deposits to igneous rocks; topics range from oxides and sulphides in and around intrusions to stratiform volcanogenic deposits. Course includes a field trip to northern Ontario and Quebec.

Geology 67.530 (GEO5130)

### **Dynamics of Sedimentary Systems**

Weathering, rivers, ocean and atmosphere, sedimentation and tectonism, basins and their sediments, P-T evolution, compaction, diagenesis, brines and fluid dynamics, mineralization, rock cycle and evolution through geological time.

Geology 67.531 (GEO5131)

### **Siliciclastic Sedimentology**

Origin and significance of physical sedimentary processes and structures. Analysis of ancient siliciclastic depositional environments in a facies model and sequence stratigraphic framework. Course involves lectures, seminars and field excursions.

Geology 67.533 (GEO5133)

### **Advanced Micropaleontology**

Selected topics in micropaleontology covered in greater detail than in introductory micropaleontology. Areas addressed include the paleoecology, biogeography and biology of foraminifera and other microfossil groups, as well as their application to biostratigraphy and paleo-oceanography.

Geology 67.535 (GEO5135)

### **Carbonate Sedimentology**

Lectures and seminars will cover aspects of modern depositional systems, dynamic facies models, sequence stratigraphy, mineralogy, and diagenesis of carbonate sediments. The practical part of the course will consist of a field-laboratory project that integrates various techniques in carbonate sedimentology (mapping, petrography, staining, Cathodoluminescence, fluorescence, SEM)

Geology 67.536 (GEO5136)

### **Paleobiology**

Selected topics in paleobiology of marine fossils. Topics include extinctions, micro- and macro-evolutionary processes, long-term trends and cycles in the Phanerozoic, and functional morphology.

Geology 67.538

### **Marine Geology**

Development of ocean basins, physical and chemical oceanographic processes, paleoceanographic changes of watermass distribution and circulation patterns, interaction between atmosphere and ocean, marine sedimentation, offshore seismic stratigraphy, marine habitats, marine instrumentation.

Geology 67.539 (GEO 5139)

### **Glacial Sedimentology**

Systematic study of various glacial and glacially related sedimentary environments and processes. Significance of genesis of glacial sediments for stratigraphic correlations, mineral exploration, interpretation of environmental geochemistry, aggregate evaluation, and hydrogeology. Weekly 2 hour lectures and field excursions.

Geology 67.540 (GEO 5140)

**Pleistocene permafrost and periglacial environments**

An examination of the stratigraphical evidence for cold, non-glacial conditions during the Pleistocene when extensive areas of mid latitude were exposed to intense frost action and permafrost. Pleistocene periglacial sediments and sedimentary structures indicative of past permafrost are considered.

Geology 67.541 (GEO5141)

**Permafrost Hydrology and Investigative Methods**

An examination of groundwater flow in permafrost regions. The importance of groundwater in the formation of various types of ground ice, and the effect of groundwater flow on permafrost distribution.

Geology 67.542 (GEO5142)

**Environmental Geoscience**

A study-seminar course in which students will examine, in depth, certain environmental problems, including geological hazards, mineral and energy consumption and environmental degradation. The relation between development and the environment will be considered. Students will prepare a report and present a seminar on a subject of their choice, and will participate in a research project centred in the Ottawa area.

Geology 67.543 (GEO5143)

**Environmental Isotopes and Groundwater Geochemistry**

Stable environmental isotopes ( $^{18}\text{O}$ ,  $^2\text{H}$ ,  $^{13}\text{C}$ ,  $^{34}\text{S}$ ,  $^{15}\text{N}$ ) in studies of groundwater origin and flow, and geothermal studies. Groundwater dating techniques involving tritium and radio-carbon, and exotic radioisotopes (e.g.,  $^{36}\text{Cl}$ ,  $^{39}\text{Ar}$ ,  $^{85}\text{Kr}$ ). Low temperature aqueous geochemistry and mineral solubility with emphasis on the carbonate system. Some application to paleoclimatology will be discussed.

Prerequisite: Fourth-year hydrogeology (67.420 or GEO4192) or the equivalent.

Geology 67.544 (GEO5144)

**Groundwater Resources**

Advanced topics in the exploration and development of groundwater resources, including detailed aquifer response analysis. Examination of hydrogeology in arid and undeveloped regions will also be included.

Prerequisite: Fourth-year hydrogeology (67.420 or GEO4192) or the equivalent.

Geology 67.546 (GEO5146)

**Numerical Methods in Hydrogeology**

Application of numerical methods in hydrogeological problem solving, including a review of governing equations, initial and boundary conditions, and both finite element and finite difference methods. Additional top-

ics to be explored include particle tracking, Laplace and Fourier transforms, and stochastic methods.

Prerequisite: Fourth-year hydrogeology or permission of instructor.

Geology 67.547 (GEO5147)

**Geochemistry of Natural Waters**

Aqueous speciation, solubility of metals, minerals and gas, reaction kinetics and equilibria. Chemistry and dynamics of groundwaters and hydrothermal fluids.

Geology 67.548 (GEO5148)

**Theory of Flow and Transport in Porous Media**

Course designed for hydrogeologists and engineers who want in-depth understanding of the theory of fluid flow and solute transport through geological materials. Emphasis on porous media. Topics to be covered: types of fluids and porous media; saturated, unsaturated, and multi-phase flow; development of solute transport equations using continuum and stochastic approaches. One three-hour lecture per week, reading and problem-solving assignments plus final examination.

Prerequisites: Fourth-year hydrogeology, second-year calculus, and first-year statistics, or permission of the instructor.

Geology 67.551 (GEO5151)

**Precambrian Geology**

Problems of Precambrian geology, emphasizing classical and current studies in North America; comparative study of the Canadian Shield and other Precambrian shields; research projects, field trips and petrologic studies of representative rock suites.

Geology 67.553 (GEO 5153)

**Computer Techniques in the Earth Sciences**

A practical course in the application of computer techniques in the acquisition and interpretation of geoscientific data. Topics will be selected from the following: remote sensing and geographic information systems; geostatistical analysis techniques; analysis and modelling of geoscientific data.

Prerequisites: Permission of the instructor.

Geology 67.557 (GEO5157)

**Tectonic Processes Emphasizing Geochronology and Metamorphism**

Applications of empirical, analytical and quantitative techniques to problems in regional geology and crustal tectonics; orogenic processes; heat and metamorphism; isotopic geochronology as applied to thermal history; derivation and interpretation of P-T-t paths.

Geology 67.560 (GEO5160)

**Chemistry of the Earth**

An investigation of the geochemical constitution of the Earth and how the Earth has evolved. Topics will include meteorites and the early history of the Earth; chemical and isotopic con-

straints on the geochemical evolution of the crust and mantle; Earth models and their limitations.

Geology 67.562 (GEO5162)

### **Physical Geochemistry**

Application of thermodynamics to geologic problems. Experimental study of mineral equilibria.

Geology 67.563 (GEO5163)

### **Stable Isotope Geochemistry**

Mechanisms of isotope fractionation in nature; physical and chemical isotope fractionation, kinetic isotope effects. Variation of stable isotope ratios (hydrogen, carbon, oxygen and sulphur) in nature. Preparation techniques of natural samples for isotope analysis. Applications of stable isotopes to study magma genesis, ore genesis, nature of water and formation fluids and sedimentary environments.

Geology 67.569 (GEO5169)

### **Radioisotope Geochemistry**

Nucleosynthesis; chemical differentiation of the Earth. Evolution of large scale reservoirs. Isotopic tracers ( $^{143}\text{Nd}/^{144}\text{Nd}$ ,  $^{87}\text{Sr}/^{86}\text{Sr}$ , common Pb). Geochronology; fundamentals and application of Sm/Nd, Rb/Sr, U/Pb, K/Ar and Lu/Hf methods. Evolution of the solid Earth from the isotopic perspective.

Precludes additional credit for 67.565 (GEO5165) (taken before 1997-98).

Geology 67.571 (GEO5171)

### **Physics of the Earth**

The physics and dynamics of the solid Earth: seismology; gravitational and magnetic fields, thermal state. Geophysical constraints on the structure and composition of the interior. Geodynamic processes.

Geology 67.572 (GEO5172)

### **Tectonophysics**

The physics of deformation; continuum mechanics approach (elasticity, strength, plasticity, viscosity), and micro-rheological approach (diffusion, dislocations, and flow mechanisms). Applications to tectonic processes.

Geology 67.573 (GEO5173)

### **Structural Geology**

Selected problems in structural geology treated in seminar and laboratory sessions. Emphasis on interpretation of fabrics developed during synmetamorphic strain. Students investigate and report on individual projects.

Geology 67.574 (GEO5174)

### **Tectonics**

An investigation of the structural style of mountain belts and their tectonic setting; tectonics of Precambrian deformed belts.

Geology 67.577F1 or W1 (GEO 5177)

### **Engineering Seismology**

Seismological topics with engineering applications. Characterization of seismicity and seis-

mic sources (areas and faults). Seismic hazard analysis. Empirical and theoretical modeling of strong ground motion in time and frequency domain.

Geology 67.590 (GEO5190)

### **Directed Studies**

Directed reading and/or laboratory studies for 1.0 credit course, under the guidance of selected extramural or intramural directors. A written description of the project must be submitted for departmental approval prior to registration. This course does not count for credit toward the graduate degree requirements.

Geology 67.591 (GEO5191)

### **Directed Studies**

Directed reading and/or laboratory studies for 0.5 credit course, under the guidance of selected extramural or intramural directors. A written description of the project must be submitted for departmental approval prior to registration. This course does not count for credit toward the graduate degree requirements.

Geology 67.593 (GEO5193)

### **Field Studies**

Systematic investigations of geological problems, based on a minimum of fifteen days field work plus related library research and laboratory projects. Written report required.

Geology 67.599 (GEO7999)

### **M.Sc. Thesis**

A thesis proposal must be approved by the research advisory committee by the end of the first year of registration.

Geology 67.699 (GEO9999)

### **Ph.D. Thesis**

A thesis proposal must be approved by the research advisory committee by the end of the first year of registration.

The following geography courses are included in the Centre's program:

*Department of Geography and Environmental Studies, Carleton University*

Geography 45.530W1

### **Soil Thermal and Hydrologic Regimes**

Characteristics of soil regimes, particularly in freezing soils, role of soil properties; analytical and numerical methods, including computer simulation.

Geography 45.532F1

### **Soil Thermal and Hydrologic Properties**

Instrumental techniques for investigation of hydrological and thermal processes near the Earth's surface, laboratory instrumentation and analysis of laboratory and field procedures in geotechnical science.

Geography 45.533W1

### **Periglacial Geomorphology**

Permafrost, its distribution and significance, seasonal ground freezing, ground thermal re-

gime, physical, thermodynamic, and geotechnical properties of freezing and thawing soils, terrain features ascribable to frost action, and solifluction and patterned ground.

Geography 45.534W1

**Aspects of Clay Mineralogy and Soil Chemistry**

The role of clay minerals in soils will be considered from a geotechnical and/or biological perspective.

Geography 45.583F1, W1, S1

**Remote Sensing and Image Analysis**

Radiometric, geometric and resolution characteristics of remotely sensed data, image processing algorithms, analysis of spectral, textural, and contextual image information, applications in vegetation mapping and environmental analysis.

*Department of Geography, University of Ottawa:*

GEG 5101

**Field and Laboratory Research Methods A**

GEG 5301

**Cold Regions Hydrology and Geomorphology**

Selected topics in the hydrology and geomorphology of cold regions. Emphasis on glacierized, periglacial, or nival environments. This course will alternate with GEG 5701.

GEG 5307

**Research Design, Modelling and Environmental Data Analysis**

Evaluation of the methodology of physical geography. Research and the role of modelling and advanced data analysis in contemporary research. This course will alternate with GEG 5707.

GEG 5701

**Hydrologie et Géomorphologie des Régions Froides**

Thèmes en hydrologie et en géomorphologie des régions froides. Exploration approfondie des environnements glaciaires, périglaciaires ou nivaux. Cours offert en alternance avec GEG 5301.

GEG 5707

**Conception d'un Projet de Recherche, Modélisation et Analyse de Données Environnementales**

Évaluation des méthodes de recherche en géographie physique. Rôle de la modélisation et de l'analyse avancée des données dans la recherche contemporaine. Cours offert en alternance avec le GEG 5307.

GEG 7103

**Palaeoenvironmental Reconstruction and Climate Change**

Theories of environmental change in relation to natural and anthropogenically induced climate

change. Techniques used in palaeoenvironmental reconstruction. This course will alternate with GEG 7503.

GEG 7107

**Northern Ecosystems**

Dynamics of northern ecosystems with particular emphasis on their sensitivity to climate variability and climate change. This course will alternate with GEG 7507.

GEG 7301

**Field and Laboratory Research Method C**

GEG 7503

**Reconstruction Paléoenvironnementale et Changement Climatique**

Théories des changements environnementaux mises en relation avec les changements climatiques d'origine naturelle ou d'origine anthropique. Méthodes utilisées dans la reconstruction paléoenvironnementale. Cours offert en alternance avec GEG 7103.

GEG 7507

**Écosystèmes Nordiques**

Dynamique des écosystèmes nordiques en mettant l'accent sur leur sensibilité à la variabilité et au changement climatiques. Cours offert en alternance avec GEG 7107.

GEG 7703

**Méthodes de Recherche sur le Terrain et au Laboratoire D.**

GEG 7107

**Northern Ecosystems**

Dynamics of northern ecosystems with particular emphasis on their sensitivity to climate variability and climate change. This course will alternate with GEG 7507.

GEG 7301

**Field and Laboratory Research Method C**

GEG 7503

**Reconstruction Paléoenvironnementale et Changement Climatique**

Théories des changements environnementaux mises en relation avec les changements climatiques d'origine naturelle ou d'origine anthropique. Méthodes utilisées dans la reconstruction paléoenvironnementale. Cours offert en alternance avec GEG 7103.

GEG 7507

**Écosystèmes Nordiques**

Dynamique des écosystèmes nordiques en mettant l'accent sur leur sensibilité à la variabilité et au changement climatiques. Cours offert en alternance avec GEG 7107.

GEG 7703

**Méthodes de Recherche sur le Terrain et au Laboratoire D.**

# History

Paterson Hall 430  
 Telephone: 520-2834  
 Fax: 520-2819  
 E-mail: grad\_history@carleton.ca

## The Department

**Chair of the Department**, E.P. Fitzgerald

**Departmental Supervisor of Graduate Studies**, Bruce Elliott

**Associate Supervisor**, To be announced

The Department of History offers programs of study leading to the Master of Arts degree in History, with concentration in the following areas: History of Women, Gender and Family, Canadian, American, British, modern French, modern Russian, international (diplomatic), medieval, and European intellectual and social history. It also offers a program of study and research leading to the Doctor of Philosophy degree in history with a concentration in Canadian history or History of Women, Gender and Family.

## Master of Arts

### Admission Requirements

The minimum requirement for admission to the master's program is an Honours bachelor's degree (or the equivalent) with at least high honours standing.

The Department offers no qualifying-year program; applicants with a general (3 year) degree may be considered for admission into the fourth year of Carleton's B.A.(Honours) program.

### Program Requirements

Candidates may follow either a thesis or a non-thesis program, as follows:

\* History 24.587, 24.588 or 24.589: a seminar or tutorial in the historiography of the appropriate country or area (1.0 credit)

\* History 24.500: a practicum in the applied uses of history (1.0 credit). Another graduate history seminar may be substituted for this course by students who have had extensive work-related experiences in some historical field.

\* A graduate history seminar in the student's major field of concentration (1.0 credit)

\* *Either* History 24.599: thesis (2.0 credits) *or*

\* History 24.598: research essay (1.0 credit) *plus* one additional seminar (1.0 credit), which may be chosen from those offered at the gradu-

ate or 400-level by the Department of History, by another department at Carleton University, or by the Department of History at the University of Ottawa

\* M.A. students are required to submit thesis or research essay proposals to the graduate supervisor early in their second term of full-time enrollment.

## Guidelines for Completion of Master's Degree

Full-time students are expected to finish all requirements for the degree except 24.598 or 24.599 during their first two terms of study; part-time students should do so during their first twelve terms of study. The research essay or thesis requirement is designed to take both categories of students an additional two or three terms, respectively.

## Language Requirements

All candidates are required to demonstrate a reading knowledge of a language other than English, the choice to depend upon the field of the candidate's thesis or research. For seminars dealing with sources not in English, a reading knowledge of the appropriate language will be required before acceptance into the program. Details may be obtained from the supervisor of graduate studies.

## Doctor of Philosophy

### Admission Requirements

Applicants with an M.A. degree will be expected to have at least high honours standing. Applicants for the History of Women, Gender and Family program will be expected to have at least one of their earlier degrees in history.

An applicant with an Honours bachelor's degree who has achieved an outstanding academic record and, in addition, exhibits very strong motivation and high promise for advanced research, may be admitted to the Canadian Ph.D. program directly. Such candidates will be required to complete at least 15.0 credits.

## Residence Requirement

The normal residence requirement for the Ph.D. degree is a minimum of three years of full-time study after the B.A. (Honours) degree, or two years after the M.A. degree.

## Program Requirements

Candidates will be responsible for three fields: a major field (Canadian history or History of Women, Gender and Family) and two minor fields. In the case of Canadian history majors,

at least one of the minor fields must concern American, British, French, Russian, or international history. In the case of History of Women, Gender and Family majors, at least one of the minor fields must concern American, British, Canadian, French, Russian, or international history. History of Women, Gender and Family majors must declare their area of concentration from among these fields. The second minor field for both majors may be a transnational topic or in a related discipline. In each instance, the minor field should cover approximately one century. Written examinations will be taken in the two minor fields before the end of the student's second term of study; an oral examination in the major field will be arranged during the student's fourth term. Ph.D. candidates are required to submit a thesis proposal to the graduate supervisor within three months of completing their oral examination.

A reading knowledge of French will be required. The language examination will be written early in the first post-M.A. year, and before the candidate is permitted to take the doctoral field examinations. Proven competence in an additional language may be required if it is pertinent to the candidate's program.

Students entering the 15-credit *Canadian history* program with a B.A. (Honours) will normally complete in their first year:

- \* History 24.588
- \* History 24.591
- \* History 24.592
- \* Two other graduate seminars

They will then join students entering the Canadian history program with a completed M.A. degree, who will normally be required to follow:

- \* History 24.688
- \* History 24.690 Ph.D. oral comprehensive examination in Canadian history; in conjunction with
- \* History 24.694 Ph.D. Tutorials
- \* Two of: History 24.610; 24.640; 24.650; 24.660; 24.693; an approved course of studies in a related discipline. At least one of these must be a national history other than Canadian (i.e. 24.610, 24.640, or 24.650).

Students declaring a major field in History of Women, Gender and Family will normally be required to follow:

- \* History 24.688
- \* History 24.692 Ph.D. oral comprehensive examination in History of Women, Gender and Family; in conjunction with
- \* History 24.695 Ph.D. Tutorials

\* Two of: History 24.610; 24.640; 24.650; 24.660; 24.691: an approved course of studies in a related discipline. At least one of these must be a national history (i.e., 24.610, 24.640, 24.650, or 24.691).

With other requirements completed, doctoral students will be required to write a thesis on a topic related to Canadian history or History of Women, Gender and Family history (5.0 credits).

## Guidelines for Completion of Doctoral Degree

It is expected that full-time students will complete the thesis requirement within two years, and part-time students within four years.

## University of Ottawa

A Carleton University student may take one seminar in the Department of History at the University of Ottawa, with permission of the two departments.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

Admission to graduate seminars in the Department of History is normally restricted to graduate students in the Department and to others who have successfully completed two full upper-level undergraduate History courses, or the equivalent, in the general area of the seminar, or who have received permission of the Department.

History 24.500T2

### Practicum in Applied History

Study of the practical uses of history in such fields as teaching and methodology, archival management, museum research, oral history, journal editing, quantitative investigations, and contract research.

History 24.506T2

### Medieval Intellectual History

An examination of selected aspects of medieval intellectual history. Also offered at the undergraduate level, with different requirements, as History 24.406, for which additional credit is precluded.

History 24.525T2

**Society and Culture in Canada, 1850-1939**

Changes to the structure and values of Canadian societies and their culture in the period of urban-industrial transition.

History 24.526T2

**Perspectives on State Formation in Canada**

An exploration of selected problems of political history: the construction of official statistics, the language of governments, the invention of nationalisms, the making of political cultures, the autonomy of the state, the practices of bureaucrats, the political role of women, the encounter of the welfare state and families, the political economy of the state, communities and the state. Also offered at the undergraduate level, with different requirements, as History 24.426, for which additional credit is precluded.

History 24.530T2

**Canadian Immigration and Ethnic History**

An examination of immigration and ethnic history in a selected period between the eighteenth and twentieth centuries. Also offered at the undergraduate level, with different requirements, as History 24.424, for which additional credit is precluded.

History 24.531T2

**French Canada Since Confederation**

A study of topics relating to the political and social history of French Canada and to problems of cultural duality.

History 24.532T2

**Ontario in the Nineteenth Century**

History 24.533T2

**Intellectual History of Canada**

An intensive examination of selected aspects of Canadian thought from the early nineteenth century to the present.

History 24.534T2

**Problems of Growth and War in Canada, 1896-1921**

History 24.535T2

**The Canadian Diplomatic Tradition**

An examination of the origins, evolution, context, and intellectual content of Canadian diplomatic practices and policies.

History 24.540T2

**The Age of the American Revolution**

History 24.556T2

**Historical Perspectives on Power**

An inquiry into historical analyses of politics in light of the current social philosophical conceptions of power and consciousness, with reference to early modern England, and/or Canada in the nineteenth and twentieth centuries, and/or Latin America in the late colonial period, with particular emphasis on Mexico, depending on the instructor(s).

History 24.557T2

**Community in Early Modern England, 1450-1600**

History 24.558T2

**Culture and Society in Eighteenth- and Nineteenth-Century Britain: Selected Topics**

History 24.559T2

**Women in Nineteenth- and Twentieth-Century North America and Britain**

An examination of the role and image of women in the context of social and economic development and of the family in North America and Britain.

History 24.560T2

**Revolutionary Russia, 1898-1921**

An examination of various primary sources available for research on revolutionary Russia. A sound reading knowledge of Russian is required for admission.

History 24.562T2

**M.S. Gorbachev and the Collapse of the USSR**

A study of the main reasons for the collapse of the USSR, with emphasis on the CPSU, Soviet ideological presumption, and its participation in the international arena. The nature of the USSR in the 1980s and Gorbachev's attempts at sweeping reform and their consequences provide the setting for this study.

History 24.580T2

**Problems in International History**

History 24.587T2

**Historiography: Women, Gender and Family**

Intensive study of selected problems in the writing of the history of women, gender and family.

History 24.588T2

**Historiography of Canada**

A seminar, primarily for graduate students in Canadian history, which examines the trends and methods of Canadian historical writing and the influences upon it.

History 24.589T2

**Historiography**

A course of directed studies, leading to an oral comprehensive examination, in one of the following fields:

*Modern France*

The intensive study of selected problems in the writing of modern French political and social history.

*Britain*

The intensive study of a range of selected problems in the writing of sixteenth-century or nineteenth-century English history.

*Modern Russia*

Concentrated reading in Russian history and historiography with emphasis on the nineteenth and early twentieth centuries.

*United States*

A course in which the trends and methods of historical writing on the United States will be examined.

*International History*

A course in which the trends and methods of historical writing on international history will be examined.

*Medieval History*

Historical method and historiography of an aspect of the Middle Ages.

*European Intellectual and Social History*

Intensive study of a selected topic in the writing of European intellectual or social history during the seventeenth, eighteenth, or nineteenth centuries.

History 24.591T2, S2

**Directed Studies in a Canadian Field**

A program of supervised reading and preparation of written work in an area not covered by an existing graduate seminar.

History 24.592T2, S2

**Directed Studies in a Non-Canadian Field**

A program of supervised reading and preparation of written work in an area not covered by an existing graduate seminar.

History 24.593F1, W1, S1

**Directed Studies in a Canadian Field**

A program of supervised reading and preparation of written work in an area not covered by an existing graduate seminar.

History 24.594F1, W1, S1

**Directed Studies in a Non-Canadian Field**

A program of supervised reading and preparation of written work in an area not covered by an existing graduate seminar.

History 24.595F1, W1

**Selected Topics in a Canadian Field**

A seminar in an area not covered by an existing graduate course.

History 24.596F1, W1

**Selected Topics in a Non-Canadian Field**

A seminar in an area not covered by an existing graduate course.

History 24.598F2, W2, S2

**M.A. Research Essay**

An examination of an approved topic in Canadian, American, British, modern French, modern Russian, international, or medieval history.

History 24.599F4, W4, S4

**M.A. Thesis**

A substantial historical investigation. The subject will be determined in consultation with the Department, and a supervisor will be assigned. The candidate will be examined orally after presenting his/her thesis.

History 24.610T2, S2

**Directed Studies**

Preparation for a minor field examination in one of the following areas of modern European history: France, Russia, and international history.

History 24.640T2, S2

**Directed Studies in United States History**

History 24.650T2, S2

**Directed Studies in British History**

History 24.660T2, S2

**Directed Studies in a Transnational Topic**

Preparation for a minor field examination in an area not covered in another doctoral course.

History 24.688T2

**Historical Theory and Method**

A course primarily for doctoral candidates in history, offered in alternate years, in which current trends in historical theory and methodology will be examined.

History 24.690F1

**Ph.D. Comprehensive Examination**

Ph.D. oral comprehensive examination in Canadian history. The exam is undertaken in the student's fourth term.

History 24.691T2

**Canadian History Minor**

A program of supervised reading in Canadian history leading to a written comprehensive examination for doctoral students whose major field is History of Women, Gender and Family. Students will attend History 24.694 in the fall and winter terms.

History 24.692F1

**Ph.D. Comprehensive Examination**

Ph.D. oral comprehensive examination in History of Women, Gender and Family. The exam is undertaken in the student's fourth term.

History 24.693T2

**History of Women, Gender and Family Minor**

A program of supervised reading in History of Women, Gender and Family leading to a written comprehensive examination for doctoral students whose major field is Canadian history. Students will attend History 24.695 in the fall and winter terms.

History 24.694F1, W1, S1

**Ph.D. Tutorials**

A program of supervised reading with several instructors in preparation for the Ph.D. oral examination in Canadian history. Students must complete three terms (F, W & S) of this course before sitting the oral comprehensive examination.

History 24.695F1, W1, S1

**Ph.D. Tutorials**

A program of supervised reading with several instructors in preparation for the Ph.D. oral examination in History of Women, Gender and Family. Students must complete three terms (F, W & S) of this course before sitting the oral comprehensive examination.

History 24.699F, W, S

**Ph.D. Thesis**

# Industrial Design

Mackenzie Building 3470  
Telephone: 520-5672  
Fax: 520-4465

## The School

**Director of the School,** To be announced

The School of Industrial Design does not offer a program at the graduate level. However, it does offer graduate-level courses which can be used towards a degree program in the School of Architecture and in the Department of Mechanical and Aerospace Engineering in the Faculty of Engineering. Members of the school are available to supervise graduate research.

The interests and capabilities of the faculty members lie in the following areas:

### *User Studies*

Applications of ergonomics and anthropometrics in industrial design; study of users from a market perspective.

### *Form Studies*

Form development in industrial design; computer-aided design in industrial design.

### *Mass Production Studies*

Advanced manufacturing methods in industrial design; quality and product life of manufactured goods.

### *Design Systems and Methods*

Research and development in systems and methods as they apply to industrial design.

### *Contextual Studies*

Cultural, social and ethical issues in industrial design.

## Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Industrial Design 85.500F1, W1

### **Directed Studies in Industrial Design**

Reading and research tutorials.

Industrial Design 85.531F1, W1, S1

### **Creative Problem Solving and Design**

This course outlines problem-solving processes and how they can be applied in engineering design. The student will be introduced to and be expected to practice various systematic and creative problem-solving techniques. The emphasis is on the student's learning methodologies rather than accumulating information. The techniques may be successfully applied in any engineering specialty. (Also listed as Engineering 88.561)

# Information and Systems Science

See the School of Mathematics and Statistics; Department of Systems and Computer Engineering; or the School of Computer Science

## The Committee

**Chair of the Committee,** John Chinneck

The program of graduate study and research leading to the degree of Master of Science in Information and Systems Science is offered by the Committee with the cooperation of the Department of Systems and Computer Engineering, the School of Mathematics and Statistics, and the School of Computer Science.

The purpose of the program is to provide training in the use and application of computers, to those who have not studied extensively in this field at the undergraduate level. The process of using the computer in problem-solving is stressed. The program is flexible, though individual concentrations are usually in one of three broad areas:

- \* computer applications in a particular field (e.g., communications, energy systems)
- \* algorithms and methodologies for solution of complex problems by computer (e.g., graph theory, operations research, optimization, simulation and modelling)
- \* computer methods and technologies (e.g., databases, software engineering, computer languages)

Close links are maintained with the scientific, industrial, and technological communities, and an effort is made to direct students to project work of current practical significance.

## Qualifying-Year Program

Offered only through the School of Mathematics and Statistics

Applicants who have a general (3 year) bachelor's degree, or who otherwise lack the required undergraduate preparation, may be admitted to a qualifying-year program. Refer to the General Regulations section of this Calendar for regulations governing the qualifying year.

## Master of Science

### Admission Requirements

Applicants should have an Honours bachelor's degree, or equivalent, with at least high honours standing, in mathematics, engineering, physics, chemistry, computer science, operations research, experimental psychology, econometrics, management science, or a related discipline. Undergraduate preparation

should include at least 2.0 credits in computing and a minimum of 3.0 credits in mathematics, at least one of which is at the third-year level or higher. In addition, the student is required to have some knowledge of quantitative applications, such as numerical analysis, simulation, operations research, etc.

Admission to the program will be made through one of the three participating departments. Since space and laboratory facilities will be provided by one of the departments, students should apply through the department with which they wish to be most closely associated.

### Program Requirements

The normal program comprises 4.0 credits and a 1.5 credit thesis; additional requirements may also be stipulated, depending upon the individual student's background. With the approval of the Committee, students who have substantial work experience may be permitted to substitute, in place of the thesis, 1.5 credit courses, one of which must be a graduate project course.

Students must take at least 1.0 credit from the department in which they are registered, and at least 0.5 credit from each of the other two participating departments. Students must also take course Information and Systems Science 93.582.

Each student should consult with his/her faculty adviser in the selection of a course pattern related to his/her principal area of interest.

Each candidate submitting a thesis will be required to undertake an oral examination on the subject of his/her thesis.

Course work may be completed on either a full-time or part-time basis. Thesis research normally requires full-time residence at the University; however, a candidate may be permitted to carry out thesis work off campus provided that suitable arrangements are made for supervision and experimental work, and prior approval is given by the Committee.

### Guidelines for Completion of Master's Degree

Full-time students in the M.Sc. in Information and Systems Science will normally complete the degree requirements in two years and part-time students within four years. In order to meet this goal, full-time students should arrange a thesis supervisor within the first term of study, and should try to complete the course requirements as quickly as possible.

## Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

FW,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

### Information and Systems Science 93.582F1 Introduction to Information and Systems Science

An introduction to the process of applying computers in problem solving. Emphasis is placed on the design and analysis of efficient computer algorithms for large, complex problems. Applications in a number of areas are presented: data manipulation, databases, computer networks, queuing systems, optimization. (Also listed as Mathematics 70.582, Engineering 94.582, Computer Science 95.582)

Information and Systems Science 93.598F3, W3, S3

### M.Sc. Thesis in Information and Systems Science

(Also listed as Mathematics 70.598, Engineering 94.598, Computer Science 95.598)

## School of Mathematics and Statistics

### Undergraduate Courses

- 70.301 Real Analysis
- 70.302 Advanced Calculus
- 70.310 Modern Algebra
- 70.350 Mathematical Statistics
- 70.403 Functional Analysis
- 70.451 Probability Theory
- 70.452 Survey Sampling
- 70.453 Applied Multivariate Analysis
- 70.456 Non-Parametric Methods
- 70.457 Statistical Inference
- 70.458 Stochastic Models
- 70.459 Topics in Stochastic Optimization and Advanced Mathematical Modelling
- 70.470 Partial Differential Equations
- 70.471 Topics in Partial Differential Equations
- 70.473 Qualitative Theory of Ordinary Differential Equations
- 70.481 Topics in Combinatorics
- 70.482 Introduction to Mathematical Logic
- 70.483 Computable Functions
- 70.485 Theory of Automata
- 70.486 Numerical Linear Algebra
- 70.487 Game Theory
- 70.488 Graph Theory and Algorithms
- 70.496 Directed Studies

### Graduate Courses

- 70.507, 70.508, 70.517, 70.519, 70.552, 70.553, 70.554, 70.555, 70.556, 70.557, 70.558, 70.559, 70.561, 70.565, 70.567, 70.569, 70.571, 70.581, 70.583, 70.584, 70.585, 70.586, 70/95.587, 70.588, 70.589, 70.590, 70.591, 70.593

## Department of Systems and Computer Engineering

### Undergraduate Courses

- 94.303 Introduction to Real-Time Systems
- 94.310 Systems Analysis
- 94.333 Real-Time Concurrent Systems
- 94.351 Communication Theory
- 94.361 Microprocessor Systems
- 94.401 Operating Systems
- 94.405 Discrete Simulation and its Applications
- 94.445 Discrete Time Systems
- 94.457 Architecture of Computer Systems
- 94.460 Digital Communications
- 94.462 Introduction to Computer Communications
- 94.480 Software Engineering
- 94.481 Software Engineering Project
- 94.485 Computer Systems Design Laboratory

### Graduate Courses

- 94.501, 94.504, 94.505, 94/95.507, 94.511, 94.517, 94.518, 94.519, 94.521, 94.527, 94.531, 94.535, 94.538, 94.541, 94.542, 94.552, 94.553, 94.554, 94.558, 94.560, 94.561, 94.562, 94.563, 94.564, 94.565, 94.566, 94.567, 94.568, 94.569, 94.571, 94.573, 94.574, 94.576, 94.577, 94.579, 94.581, 94.583, 94.584, 94.596

## School of Computer Science

### Undergraduate Courses

- 95.300 Operating Systems
- 95.304 Software Systems Development
- 95.305 Database Management Systems
- 95.401 Distributed Computing
- 95.402 Computer Graphics
- 95.403 Transaction Processing Systems
- 95.407 Applied Artificial Intelligence
- 95.409 Introduction to Parallel and Systolic Computing
- 95.410 Multimedia Systems
- 95.413 Computer Security and Cryptography

### Graduate Courses

- 95.501, 95.502, 95.503, 95.504, 95.505, 95.506, 94/95.507, 95.508, 95.509, 95.510, 95.511, 95.512, 95.513, 95.514, 95.515, 95.516, 95.520, 95.522, 95.524, 95.526, 95.528, 95.573, 95.574

Due to the interdisciplinary nature of ISS, a student will in some cases benefit by taking an undergraduate course at the 300- or 400-level as part of his/her program. Where a 300-level course is to be taken, it will be extra to the degree requirements, or else arrangements will be made to enrich the subject matter, normally through a directed study course with the professor. Students may include 1.0 credit at the 400-level in their program without penalty, with the approval of the Department. The 300- and 400-level courses listed here are those most likely to interest ISS students; see the *Undergraduate Calendar* for a complete list. Students in the program are prohibited from taking Computer Science 95.484 Design and Analysis of Algorithms due to overlap of course material with Information and Systems Science 93.582.

## Interdisciplinary Studies

Dunton Tower 2216  
Telephone: 520-2368  
Fax: 520-3985

### The Institute

**Director of the Institute**, Andrew Brook

**Associate Director and Coordinator of Directed Interdisciplinary Studies**, Charles C. Gordon

The Institute of Interdisciplinary Studies offers graduate level courses which can be used towards a degree program in another discipline.

### Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registrarial Instructions and Class Schedule* booklet published in the summer.

FW,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

Social Sciences 03.510F1 or W1

#### **Researching Across Disciplines**

Focuses on cross-disciplinary research issues and methodological solutions to problems that arise in the dialogue among the sciences, humanities and social sciences.

# International Affairs

Paterson Hall, Level 2A  
 Telephone: 520-6655  
 Fax: 520-2889  
 E-mail: [international\\_affairs@carleton.ca](mailto:international_affairs@carleton.ca)

## The School

**Director of the School, M.A. Molot**

**Associate Director, Martin Rudner**

The Norman Paterson School of International Affairs (NPSIA) was established in the mid-1960s with the generous support of the late Senator Norman M. Paterson to encourage and promote graduate study and professional research and publications in the field of international affairs. The NPSIA program is interdisciplinary, reflecting the philosophy that exposure to a range of disciplines is necessary to develop an understanding of our complex global environment.

NPSIA's program puts an emphasis on imparting professional skills as well as knowledge. Our courses are policy as opposed to theoretically oriented and frequently involve the use of case studies and simulations. The great majority of our students see the MA as their path to the workforce. NPSIA graduates find employment in Canada and abroad in government departments, non-governmental and international organizations, and the private sector. More detailed information on the range of jobs held by NPSIA graduates can be found on our website.

NPSIA is a longstanding member of the Association of Professional Schools of International Affairs (APSIA), an association of the leading graduate programs in international affairs in countries that include the United States, France, Japan, and Russia. Like other APSIA schools NPSIA's *raison d'être* is the training of students for leadership in a world in which the destinies of all countries are increasingly linked by considerations of conflict resolution and peacebuilding, international trade and finance, development, and the sharing of human and natural resources. Many professionals currently working in the sphere of international affairs are alumni of APSIA graduate programs. Like its peers in APSIA, NPSIA is proud of its reputation for producing diverse, well-educated and sophisticated international affairs professionals.

The program is organized around six clusters:

- International Trade Policy
- Global Finance, Multinationals and the State
- Conflict Analysis and Conflict Resolution
- Human Security and Global Governance

- International Dimensions of Development
- National and Sub-National Aspects of Development

Students are encouraged to include at least one regional course in their degree program to provide an area focus to their studies. NPSIA offers a range of regional courses that can be linked to relevant course clusters to give students some regional expertise. NPSIA cooperates closely with the Institute of European and Russian Studies and with committees organized to encourage and coordinate faculty and student interests in Africa, Asia and Latin America.

NPSIA has a specialized Resource Centre staffed by a full-time information specialist. Students and faculty have access to a broad range of current research materials, using the resources of the national capital area as well as internet-based bibliographic services across the range of issues and regions on which courses are offered.

## Qualifying-Year Program

### Admission Requirements

The qualifying-year program is designed to enable students with at least high honours standing, but with an inadequate background in the disciplines relevant to the M.A. program, to make up deficiencies. Candidates with a high standing in a general (3 year) bachelor's degree, in a discipline closely related to international affairs, will be required to take five full qualifying-year credits before being eligible to enter the master's program. Those with a B.A.(Honours) degree in an unrelated discipline may be required to take at least three full qualifying-year credits before being eligible to enter the master's program.

Students in the qualifying year are encouraged to select a cluster or clusters in which they are interested and to take courses that will prepare them for graduate work in that cluster. Courses in anthropology, economics, geography, history, law, political science, and sociology, among other disciplines, are recommended. Students may also wish to select an area emphasis and to take courses that will enable them, in the M.A. year, to engage in specialized study of a region having particular relevance to the cluster(s) they have identified. Students should also be cognizant of the language requirement at the M.A. level and, if necessary, take the appropriate courses to enable them to fulfil that requirement.

Students who have not previously completed a full-year introductory course in Economics must do so as part of their Qualifying Year Program. Students should also select at least one of Economics 43.361, 43.362, or 43.363

depending on their cluster interests. Other courses will be selected in consultation with the student's supervisor or the Associate Director. Students who have not taken an introductory course in international politics should consider enrolling in Political Science 47.261 and 47.262.

Admission to the qualifying year does not guarantee admission to the M.A. program. To be considered for admission to the M.A. program, students in the qualifying year are expected to achieve the equivalent of high honours standing. Students in the qualifying year are considered for admission to the M.A. program at the same time as other applicants; if qualifying-year students are not admitted to the M.A. program in the first round of admissions, subsequent decisions on their admission will depend on performance and the availability of space in the M.A. program.

## Guidelines for Completion of Qualifying Year

Candidates admitted to the qualifying-year program on a full-time basis must complete all requirements during the fall and winter terms after initial registration.

## Master of Arts

### Admission Requirements

The minimum requirement for admission into the master's program is a B.A.(Honours) degree in a discipline related to international affairs.

Under current practice, at least a high honours standing is normally required for consideration for admission to the program.

Applicants may submit Graduate Record Examination aptitude test scores; in some circumstances, students may be required to submit GRE scores.

The Faculty of Graduate Studies and Research requires applicants whose native tongue is not English to be tested for proficiency in English, as described in Section 3.6 of the General Regulations of this Calendar (see p.55.)

Students admitted to the NPSIA M.A. program are strongly advised to complete an introductory course in economics prior to beginning the master's program. Students without an introductory economics course will be required to complete such a course prior to graduation. This course will be extra to degree and may delay completion of the M.A. program. Candidates who lack the required background in international affairs will be expected to complete a maximum of two additional courses. Students who are uncertain about whether they meet the background requirements are encouraged to contact the School.

The deadline for completed applications is January 31. The deadline for consideration for financial assistance is also January 31. Applicants are responsible for ensuring that their completed applications are received at NPSIA by the deadline.

## Program Requirements

Students may follow either a thesis/research essay program or a course work program.

### Thesis/Research Essay Program

The normal program requirements for M.A. students in international affairs are:

- Completion of 46.501 Policy and Methods for International Affairs and one of 46.509, 46.538 or 46.539 depending on a student's choice of cluster. If a student can demonstrate that he/she has already completed the equivalent of the designated NPSIA economics course, he/she may substitute another NPSIA course.
- Completion of at least two designated courses from the student's chosen cluster.
- 1.0 approved course work credits in international affairs or related disciplines, if a student elects to write a thesis.
- 2.0 approved course work credits in international affairs or related disciplines, if a student elects to write a research essay.
- A thesis (equivalent to 2.0 credits) or a research essay (equivalent to 1.0 credit) involving original research on an approved subject in international affairs relating to the student's cluster choice.
- Full-time students are expected to submit a thesis/research essay proposal by the end of January following their first term of study in the program; part-time students are expected to submit a thesis/research proposal after completion of half of their course requirements.
- An ability to read a second major international language, or a language appropriate to a student's major research interest
- English-speaking Canadian students are expected to develop a proficiency in French,
- An oral comprehensive examination on the thesis or research essay in their general field of study to determine the candidate's ability to relate various disciplines to the study of international affairs

### Course Work Program

- Completion of 46.501 Policy and Methods for International Affairs and one of 46.509, 46.538 or 46.539 depending on a student's choice of cluster. If a student can demonstrate that he/she has already completed the equivalent

lent of the designated NPSIA economics course, he/she may substitute another NPSIA course.

- Completion of at least two designated courses from the student's chosen cluster.
- Three approved courses selected as in thesis/research essay program excluding 46.598/46.599;
- Language requirement as in thesis/research essay program;
- An oral comprehensive examination (46.597F4, W4, S4) in the candidate's cluster and program to determine the candidate's ability to relate various disciplines to the study of International Affairs. The examination will normally be taken upon the completion of course work requirements. The student opting for the 46.597 option will identify two courses and a paper which will form the basis of the oral examination, one of which must be a designated course from his/her cluster. The paper may come from either of the two courses.

## Academic Standing

A grade of B- or better must be obtained in each credit counted towards the master's degree. The School does not permit exceptions to this rule.

## Career Planning

Information on job opportunities is available to all students and recent graduates through NPSIA's Resource Centre Coordinator. NPSIA produces two publications – *NPSIA Works: Career Futures* and *NPSIA Works: Getting There* – designed to assist students in obtaining jobs in International Affairs after graduation. Recent experience suggests that a strong background in research methods and economics as well as strong communications skills enhances job placement.

Students interested in continuing to doctoral programs should plan their programs to include courses in their discipline, if other than international affairs, which may be deemed necessary for their admission to doctoral programs. Interdisciplinary doctoral programs in international affairs are given in a number of institutions, and the faculty can provide guidance in planning for these programs.

## Guidelines for the Completion of the Master's Degree

Candidates can complete the M.A. program in twelve months of full-time study. However, most students require an additional one or two terms to complete the research essay or thesis requirement. Full-time master's students must complete all degree requirements within six terms of registered full-time study.

Part-time master's students must complete degree requirements within an elapsed period of six calendar years after the date of initial registration.

Students who elect to complete the program by a combination of full-time and part-time study are governed by the following elapsed time limitations: five calendar years if the candidate is registered as a full-time student for two or three terms and part-time for the balance; four calendar years if the candidate is registered for four or five terms as a full-time student and part-time for the balance.

These limitations are calculated from the date of initial registration in the master's program.

## Certificate in Health and Social Policy in Development

The Norman Paterson School of International Affairs, in conjunction with the Canadian Association of University Schools of Nursing, the Centre for International Health and Development at the University of Ottawa, and the International Development Research Centre, offers a Certificate in Health and Social Policy in Development.

The Certificate program is intended for practitioners in the health and social policy fields who wish to upgrade or re-orient their careers with a focus on international development.

Students are advised to contact the School for information on admission and program requirements, course scheduling, and fee schedules.

## Master of Arts/Bachelor of Laws

The Norman Paterson School of International Affairs and the Common Law Section of the Faculty of Law at the University of Ottawa offer a joint Master of Arts in International Affairs and Bachelor of Laws degree (M.A./LL.B.).

## Admission Requirements

A student must make separate applications to the School of International Affairs at Carleton University and to the Faculty of Law at the University of Ottawa and be accepted by both institutions in accordance with the normal admission requirements of each program. Interest in pursuing the joint program must be specified in each application, and a joint committee will make a decision on admission to the joint program.

## Program Requirements

A student will complete both the M.A. and the LL.B. programs over four calendar years. Students will be expected to fulfill the normal requirements of both the M.A. and LL.B. programs. In addition, students in the joint pro-

gram will be required to complete courses in international law to be specified by the Faculty of Law.

In undertaking the research essay/thesis, students will be expected to integrate both components of the joint program into their research essay/thesis and will be assigned supervisors from both institutions.

The normal sequence of courses for the two degrees is as follows:

*First Year*

\* Normal LL.B. first year

*Second Year*

\* Normal M.A. first year (required course work to include a 0.5 credit course in international law)

*Third Year*

\* Normal LL.B. second year, including 0.5 credit course from the School of International Affairs for which credit will be given in both programs and spring/summer registration in M.A. research essay/thesis

*Fourth Year*

\* Normal LL.B. third year, including 0.5 credit course from the School of International Affairs for which credit will be given in both programs and spring/summer registration, conclusion and defence of M.A. research essay/thesis

## Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

FW/S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

Part-time students are permitted to enrol in a maximum of 1.0 credit per term.

## Required Courses

International Affairs 46.501 F1 or W1

### Policy and Methods for International Affairs

Policy formulation and research methods in an international context. The policy component reviews key theories of policy formulation and their relationship to applied policy analysis and evaluation. The methods component examines the principles of social science research, basic research design, and techniques of analysis. Prerequisite: MA standing in the Norman Paterson School of International Affairs or permission of the School.

International Affairs 46.509F1 or W1

### Economic Development: Theory and Policy

This course examines economic theory and policy dimensions of development. Topics include: different concepts and goals of development policy, strategies for sectoral development, technology transfer, trade policy, domestic and foreign resource mobilization, monetary and fiscal policy, and the economics of human development and environmental sustainability.

Prerequisite: MA standing in the Norman Paterson School of International Affairs or permission of the School.

International Affairs 46.538F1 or W1

### International Trade: Theory and Policy

This course examines the pure theory of international trade and selected policy issues. Topics include theories of the pattern of trade, the gains from trade, the theory of distortions and welfare, and theories of endogenous trade policy formation.

Prerequisite: MA standing in the Norman Paterson School of International Affairs or permission of the School.

International Affairs 46.539F1 or W1

### International Finance: Theory and Policy

This course examines theory and policy in open economy macroeconomics and international finance. Topics include: exchange rate and output determination, balance of payments adjustment, monetary and fiscal policy under different exchange rate regimes, and the structure and performance of the international monetary system.

Prerequisite: MA standing in the Norman Paterson School of International Affairs or permission of the School.

Note: Students are required to take the Economics course appropriate to their cluster. The appropriate course will be determined in consultation with NPSIA faculty. If a student can demonstrate that he/she has already completed the equivalent of the designated NPSIA economics course, he/she may substitute another NPSIA course.

## Clusters

NPSIA's M.A. program is organized around six clusters. Each student must select a cluster and enrol in two of the designated cluster courses.

## International Trade Policy

### Designated Courses:

- 46.511 The Politics and Institutions of International Trade
- 46.540 Trade Policy Analysis
- 46.550 Comparative Trade Policy
- 46.557 International Economic Law

## Global Finance, Multinationals and the State

### Designated Courses:

- 46.530 The Political Economy of Multinational Enterprises
- 46.540 International Financial Institutions and Policy
- 46.550 Global Political Economy
- 46.551 State Sovereignty and Globalization

## Conflict Analysis and Conflict Resolution

### Designated Courses:

- 46.518 Conflict Analysis
- 46.519 Conflict Management: Theory and Evidence
- 46.520 Peacebuilding and Reconstruction: Theory and Practice
- 46.523 International Mediation and Conflict Resolution

## Human Security and Global Governance

### Designated Courses:

- 46.545 International Organizations in International Affairs
- 46.555 International Law: Theory and Practice
- 46.560 Human Resource Development
- 46.571 Global Environment Change

## International Dimensions of Development

### Designated Courses:

- 46.502 Issues in International Development
- 46.533 Science, Technology and International Affairs: The Third World
- 46.562 The Institutional Framework for Development Assistance
- 46.581 Regional Integration Among Developing Countries

## National and Sub-National Aspects of Development

### Designated Courses:

- 46.503 National and Domestic Dimensions of Development
- 46.506 Agriculture and Rural Development
- 46.560 Human Resource Development
- 46.561 Historical Dimensions of Development and Underdevelopment

## Other Courses

International Affairs 46.502F1 or W1

### Issues in International Development

International political, social and economic aspects of development. Topics include: approaches to trade policies, finance, regional

integration, technology transfer and transnational enterprises, global governance, international civil society and development, the environment and natural resources, and social and labour issues in the international context. Precludes additional credit for International Affairs 46.504 (taken prior to 2001).

International Affairs 46.503F1 or W1

### National and Domestic Dimensions of Development

Theoretical foundations and central policy issues of the domestic, economic, social, political, cultural and environmental aspects of development. Topics include theories of the developmental process, human resource development, national development strategies, sectoral issues, and governance and human rights and their interaction with the international system.

Precludes additional credit for International Affairs 46.504 (taken prior to 2001).

International Affairs 46.506F1 or W1

### Agriculture and Rural Development

A study of the agricultural sector, rural areas, and rural welfare in developing countries, including consideration of structural change in agriculture, agrarian reform, rural development strategies in various countries, and public policies affecting agriculture, activities ancillary to agriculture, rural industry, and public service.

International Affairs 46.507F1 or W1

### Theories of Development and Underdevelopment

A comparative analysis of approaches to the study of development processes and underdevelopment, including structural-functional, neo-classical, Marxist, and dependency theories.

Prerequisite: Enrolment in the Development Administration stream of the M.A. program in the School of Public Policy and Administration, or permission of the School.

International Affairs 46.508F1 or W1

### Economic Development Policy and Planning

Developing country policies and planning, and their impacts, including macro and sectoral techniques employed in development planning, budgeting, and problems in development administration.

Prerequisite: Enrolment in the Development Administration stream of the M.A. program in the School of Public Policy and Administration, or permission of the School.

International Affairs 46.510W1

### Canada in International Affairs

This course examines Canada's role in international affairs with special attention to issues of conflict and conflict resolution, international political economy, and international development. Both the content and formulation of Canada's international policies are analyzed.

International Affairs 46.511F1 or W1 or S1

**The Politics and Institutions of International Trade**

The course considers Canadian trade practice, places trade policy within the broader context of Canadian policy-making, and compares Canadian policy and practice to that in the United States, Europe, Japan, and the major developing countries.

Precludes additional credit for International Affairs 46.549 (taken prior to 1997-98).

International Affairs 46.518F1 or W1

**Conflict Analysis**

This seminar examines the sources of international and intrastate conflict. Students will gain practical insight and understanding of the causes of conflict by drawing on frameworks from a number of social science disciplines, with a focus on diagnostic and analytical skills in the decision making process.

Precludes additional credit for International Affairs 46.515 (taken prior to 2001).

International Affairs 46.519F1 or W1

**Conflict Management: Theory and Evidence**

An evaluation of both process and content-oriented measurements of effectiveness in the practice of conflict management with special attention to third party intervention such as peacekeeping, crisis decision making, the management of terrorism and conflict prevention with applications to regional and intrastate conflict.

Precludes additional credit for International Affairs 46.515 (taken prior to 2001).

International Affairs 46.520F1 or W1

**Peacebuilding and Reconstruction: Theory and Practice**

This course focuses on the social, economic and military dimensions of post-conflict reconstruction with special attention to the role of local and international government and non-government organizations in the peacebuilding process. Evidence is drawn from recent cases

International Affairs 46.521F1 or W1

**Theory and Practice of Arms Control**

This course explores the theoretical and analytical underpinnings of modern arms control, including nuclear non-proliferation issues in the post Cold War era with special emphasis on the impact of political, economic, technological and social-psychological factors on international security.

International Affairs 46.522F1 or W1

**International Security After the Cold War**

This course examines the evolving strategic and security environment in international relations after the Cold War, addressing both traditional and non-traditional concepts of national and international security. Topics discussed include new threats to security such as transnational crime, forced migration and international terrorism.

International Affairs 46.523F1 or W1

**International Mediation and Conflict Resolution**

This seminar explores various approaches to the prevention, management and resolution of international conflict. These approaches may include, peacekeeping, preventive diplomacy, mediation and peacebuilding, as well as less formal mechanisms for third party collaborative problem solving.

International Affairs 46.527F1 or W1

**Middle East Economic and Political Relations**

A course on economic and political relations among countries of the Middle East. Emphasis will be placed on the peace process and arrangements for regional security and regional economic cooperation, among them the prospects for regional collaboration.

International Affairs 46.529F1 or W1

**Conflict in Southern Africa**

A critical examination of competing interpretations of conflict in southern Africa, including approaches to conflict resolution.

International Affairs 46.530F1

**Political Economy of Multinational Enterprises**

An appreciation of recent economic and political developments in the fields of international economics and industrial organization as they affect multinational enterprises. The course develops concepts and analytical approaches to examine the impact of multinational enterprises on international affairs and the implications for public policy.

International Affairs 46.532F1 or W1

**Science, Technology and International Affairs: The Advanced, Industrial Countries**

This seminar analyzes the process of technological change since the industrial revolution and examines its consequences for development in the advanced industrial countries and for relations among these countries.

International Affairs 46.533F1 or W1

**Science, Technology and International Affairs: The Third World**

This seminar focuses upon the problem of building indigenous technological capabilities in the Third World. It examines the role of MNCs in the transfer of technology, the generation of appropriate technologies locally and the role of the state in the formulation of technology policy for development.

International Affairs 46.534F1 or W1

**Agribusiness North and South**

Analysis of the transformation of agriculture into an integrated multi-sectoral food production system and of its theoretical implications. Focus on the growth and strategies of agribusiness institutions in advanced industrial societies and

on their penetration into, and impact upon, Third World economies. (Also listed as Geography 45.558)

International Affairs 46.535F1 or W1

**International Bargaining and Negotiation: Theory and Practice**

An examination of bargaining and negotiation in international economic, political, and security issue areas, emphasizing case studies as well as theoretical analysis.

International Affairs 46.536F1 or W1

**Introduction to the North American Free Trade Agreement (NAFTA)**

An examination of the background to NAFTA, the negotiation of NAFTA and the side agreements, the provisions of NAFTA, the evolution of political, economic, and social relations in North America since the implementation of NAFTA, and the processes and implications of accession of other countries.

International Affairs 46.537W1

**Macroeconomics in a Development Context**

An examination of macroeconomic theory and policy in the context of the developing countries, with special emphasis upon theory and policy for open economies, structural adjustment to international disequilibrium, exchange rate and balance of payments management, fiscal and financial policy.

Prerequisite: Enrolment in the Development Administration stream of the M.A. program of the School of Public Administration, or permission of the School.

International Affairs 46.540F1 or W1

**Trade Policy Analysis**

This course examines selected trade and trade-related policy issues. Topics are drawn from current policy debates, and may include: multilateral vs. preferential trade liberalization; standards harmonization as a precondition for free trade; and globalization and the rising skill wage premium.

Prerequisites: International Affairs 46.538 or the equivalent, M.A. standing in the Norman Paterson School of International Affairs, or permission of the School.

International Affairs 46.541F1 or W1

**International Financial Institutions and Policy**

An examination of institutional arrangements, international financial flows, and critical events in the field of international finance. The emphasis is on tracing the development and operation of international financial institutions, and how they have shaped modern financial markets, events, and policy.

Precludes additional credit for International Affairs 46.549 (taken prior to 1997-98).

International Affairs 46.542F1 or W1

**Territory and Territoriality**

Contemporary geographical and international relations theorizing is challenging conventional notions of boundaries and territories in the political organization of modernity. Using contemporary writings on geopolitics, security, sovereignty, self-determination and identity politics, this course investigates territoriality as a political and intellectual strategy. (Also listed as Geography 45.540).

International Affairs 46.544F1 or W1

**The Environment for International Management**

Analysis of the international economic environment for public and private sector managers. The course examines the growing economic interdependence of nations, the problems faced by managers and the effectiveness of emerging international rules and standards for trade, investment and intellectual property.

International Affairs 46.545F1 or W1

**International Organizations in International Affairs**

A critical analysis of the roles played by the United Nations and other international organizations in the field of international conflict, development, and political economy.

International Affairs 46.546F1 or W1

**Policy Analysis and Evaluation**

An examination of the international public policies of a number of countries, including Canada. The seminar focuses on various approaches to the policy process and examines case studies of the formulation and evaluation of economic, political, and security policies.

International Affairs 46.547F1 or W1

**International Relations Theory**

This course provides an overview of theories of international relations. Organized both historically and conceptually, the course will examine a variety of theoretical approaches to international relations, among them the realist, liberal, structural, neo-realist, and critical perspectives.

International Affairs 46.548F1 or W1 or S1

**Gender in International Affairs**

This course examines the role of gender differences in international affairs. It analyzes the concept of gender in the social sciences and considers feminist theories regarding war, nationalism, human rights, development, and the global economy.

Precludes additional credit for International Affairs 46.549R and S (taken prior to 1997-98).

International Affairs 46.549F1, W1, S1

**Selected Topics in International Affairs**

International Affairs 46.550F1 or W1

**Comparative Trade Policy**

An examination of the trade policies of various states, and their associated institutional arrangements. Countries and country groupings to be examined include the United States, Japan, the European Union, and key developing countries.

International Affairs 46.551F1 or W1

**Global Political Economy**

A presentation of theories and approaches to global political economy, and how they illuminate the interaction and co-evolution of states and markets. Topics include the post war systems and patterns of production, investment, trade and finance in developed and developing countries.

Precludes additional credit for International Affairs 46.500 (taken prior to 2001).

International Affairs 46.552F1 or W1

**State Sovereignty and Globalization**

An examination of how increased political, social and economic integration internationally affects a government's ability to formulate policy. The course examines a variety of domestic and international policy issues and analyzes whether and how global forces and their domestic counterparts shape the policy-making environment.

Precludes additional credit for International Affairs 46.500 (taken prior to 2001).

International Affairs 46.555F1 or W1

**International Law: Theory and Practice**

Examines various theoretical perspectives on international law and locates role international law plays in the international system. Topics include basis, creation and sources of international law, international dispute resolution, and international law and world order transformation. (Also listed as Law 51.563)

International Affairs 46.557F1 or W1

**International Economic Law: Regulation of Trade and Investment**

Study of regulation of international economic relations. Discussion of international institutions, legal aspects of integration, governmental regulation of trade and investment. (Also listed as Law 51.520).

Prerequisite: Open only to graduate students in their master's year who have not previously studied international economic law.

International Affairs 46.560F1 or W1

**Human Resource Development**

An analysis of theory and policy regarding some of the major areas of human development in the developing areas, including demography and population, education, public health, nutrition, women and development, social security, employment, and manpower planning.

International Affairs 46.561F1 or W1

**Historical Dimensions of Development and Underdevelopment**

Comparative studies in the economic and social history of selected developed and developing countries. The aim is to identify conditions which have fostered or inhibited development in the past, and thereby to assess contemporary development strategies in the light of historical experience.

International Affairs 46.562F1 or W1

**International Assistance: Institutions, Policies, Programs, Performance Assessments**

The course examines the policies and programs of governmental, non-governmental and multi-lateral organizations involved in international development assistance. Particular attention is paid to their political dynamics, strategic orientations, administrative operations, transfer mechanisms, operational priorities and developmental impact.

International Affairs 46.563F1 or W1

**Issues in Development in Africa**

Analysis of structures and processes of political, social, and economic change in intertropical Africa at scales ranging from the intrahousehold and local community to the state and international system. An objective will be to integrate gender and the environment into analyses which draw on theories of political economy. (Also listed as Geography 45.520)

International Affairs 46.564F1 or W1

**Issues in Development in Latin America**

An examination of the principal developmental trends, problems, and policies in the region as they have evolved since 1945. Emphasis will be given to the design and implementation of alternative developmental strategies in the future.

International Affairs 46.565F1 or W1

**The Ethical Dimension of International Affairs**

This course critically examines the ethical dimensions of development, global conflict, and international political economy. Subject matter includes beliefs and values, rights and obligations, and individual and state morality.

International Affairs 46.566F1 or W1

**Indigenous Peoples and Development**

An examination of some major issues of the development, in its social, economic, political and environmental dimensions of Indigenous Peoples, including those of North America, Latin America, Australasia, India, Africa and the Polar Regions.

International Affairs 46.567F1 or W1

**Issues in Development in Southeast Asia**

This course offers a comparative analysis of the development experience of selected Southeast Asian countries. It addresses the proc-

esses of continuity and change in political culture, governance, economic management, social and environmental policy, and regional ASEAN relations. Attention is paid to historical and contemporary issues.

International Affairs 46.568F1 or W1

**Indigenous Perspectives on Third World Development**

This course examines some of the major perspectives and theories on Third World Development which have emerged from within the Third World. Included are authors representing structural, dependency, and radical theories of development, as well as those who see development as psychological or spiritual liberation.

International Affairs 46.569F1 or W1

**Development Project Evaluation and Analysis**

An examination of social cost-benefit analysis and other micro-economic methods of project evaluation in the context of the project cycle in developing countries. Emphasis will be placed on policy analysis and implementation practice, case studies of development projects, including those of non-governmental organizations.

International Affairs 46.570F1 or W1

**The Natural Ecosystem**

Analyzes human involvement in the natural environment as a development ecosystem. Discusses how the environment continues to be modified and its long term consequences due to rapid technological advances. Attention will be given to individual development projects including their political and social setting.

International Affairs 46.571F1 or W1

**Global Environmental Change: Human Implications**

Global environmental change; its significance for societies, economies and international relations. Value systems underlying environmental discourse; political economy of the environment; sustainability and security. Environmental diplomacy and grassroots environmentalism. Regionalized impacts of pressures on natural environments; challenges of adaptation. (Also listed as Geography 45.505)

International Affairs 46.575F1 or W1 or S1

**International Health, Social Policy and Planning**

This course focuses on health, social policy and planning in developing countries. Topics covered will include primary health care, the role of government in health administration, social policy formation, expenditure analysis in health and social factors, and techniques of policy evaluation in these sectors. Precludes additional credit for International Affairs 46.549W (taken prior to 1997-98).

International Affairs 46.580F1 or W1

**Asia Pacific Economic and Political Relations**

Addresses the evolving pattern of economic and political relations in the Asia-Pacific region. Topics will include security issues; trade and investment; and development cooperation. Particular consideration will be given to institutional arrangements, including ASEAN, APEC, AFTA and Canada's role in the regional affairs.

International Affairs 46.581F1 or W1

**Regional Cooperation Among Developing Countries**

A comparative study of selected regional cooperation and integration schemes, including those in Africa, Asia, Latin America, and the Caribbean, as well as between higher and lower income countries.

International Affairs 46.582F1 or W1

**The International Political Economy of Transition**

Problems of reintegration into the world economy and dilemmas of transition from command to market economies. Topics may include new trade and investment patterns, role in regional and international economic organizations, search for appropriate exchange rate policies, impact of Western assistance. (Also listed as European and Russian Studies 55.512)

International Affairs 46.584F1 or W1

**International Relations in Europe**

This course examines international relations and organizations in Europe from theoretical and historical perspectives. Topics discussed include the origins and development of European organizations such as the European Union and the Organization for Security and Co-operation in Europe.

International Affairs 46.591F1, W1, S1

**Tutorials in International Affairs**

To be chosen in consultation with the director.

International Affairs 46.595F1, W1, S1

**Research Workshop**

This seminar focuses on the special problems of research design in the interdisciplinary field of international affairs, with materials drawn from both the established literature and the practice of leading members of the School's faculty.

International Affairs 46.597F4, W4, S4

**Course Work Comprehensive in International Affairs**

Required for students in a course work M.A. who by the third term in their M.A. program have not yet completed their comprehensive examination. Completion of this course does not reduce the formal requirement of 5.0 credits.

## **International Affairs**

International Affairs 46.598F2, W2, S2

### **Research Essay**

International Affairs 46.599F4, W4, S4

### **M.A. Thesis**

## **Selection of Courses**

In addition to the graduate courses offered in the School, qualified students may choose from among courses in international affairs offered by related departments, schools, and institutes.

# Journalism and Communication

St. Patrick's Building 346  
Telephone: 520-7404  
Fax: 520-6690  
E-mail: journalism@carleton.ca

## The School

**Director of the School,** Christopher Dornan

**Supervisor of Graduate Studies (Journalism);**  
C. Mc Kercher

The School of Journalism and Communication offers courses leading to the degree of Master of Journalism. (For a description of the degrees of Master of Arts and Ph.D. in Communication, see p.234.) The emphasis in the M.J. program is on advanced professional education for those who are or intend to become practising journalists in the news media. In practical terms, this entails both the polishing of professional journalistic skills to a high level of proficiency and advanced education in a related field of study. Provision is made also for students who wish to undertake research in journalism and mass media.

Following a common first year of professional coursework, students in the master's program will choose one of three areas of concentration in their second year of study:

### *Specialized Print Reporting*

At present, specializations are offered in the fields of politics/public administration, international affairs, and economics/business. Others may be added as resources become available.

### *Broadcast Journalism*

The focus of this specialty will be the study of advanced techniques in reporting, writing and producing programs for the broadcast media.

### *Journalism Studies*

This program is designed for applicants who have mastered the skills of reporting and writing for the news media but who wish to spend a year studying their craft and/or the news industry. This specialty encompasses a number of topics, which include the role of the media in society as it is conceived by selected social and political theorists, communications law, politics and the media, the economics of the media, and journalism history.

Carleton's School of Journalism and Communication is uniquely situated for advanced journalism study. It offers ready access to many of the people and institutions that most directly influence Canadian affairs: Parliament, federal government departments and agencies, embassies, business and labour organizations, and major economic and cultural institutions.

## Master of Journalism

### Admission Requirements

The Master of Journalism program comprises 10.0 credits. Most applicants will be admitted to the First year of a two-year course of study, but some may qualify for admission directly to the Second year (see below). An admissions committee, including the supervisor of graduate studies, will determine the admissions qualifications of each applicant.

Admission will be selective. Admission will not be guaranteed to all who meet the published minimum requirements, as there are many more qualified applicants each year than there are available spaces.

A student who holds a bachelor's or master's degree from a recognized university in a field other than journalism may be admitted to the first year of study if he or she achieved at least high honours standing. Such students who complete the core first year, outlined below, and meet the requirements of the Faculty of Graduate Studies and Research, Section 11 of the General Regulations section of this Calendar (see p.62), may proceed to Second year.

Applicants who have a three-year journalism degree with high honours standing may be admitted to a First year made up largely of approved courses from the Faculties of Arts and Social Sciences and Public Affairs and Management. Such students may proceed to the second year of study if they have achieved high honours standing.

A limited number of spaces will be made available for direct admission to the Second year of the M.J. program. Students must normally possess one of the following qualifications to be considered for this advanced admission: a B.J. (Honours) or the equivalent with high second-class standing, or a degree in another discipline from a recognized university plus at least five years of professional experience in journalism, or long and distinguished professional experience in journalism. Students with suitable professional qualifications but no degree may occasionally be admitted to a program in which they take a required number of undergraduate courses in addition to the M.J. program.

Application is made on forms available from the School of Journalism and Communication. Students applying for the first year of the program are advised to apply by June 1 as enrollment in the School is limited. All applications received after June 1 will normally be considered only for entry into the program in the year following.

As a condition for graduation, all students are required to have a minimum of four months of practical experience in the media, and a working knowledge of a second language, preferably French.

## Program Requirements

### First Year

Candidates admitted to the first year of the Master of Journalism program must complete the following courses before proceeding to the second year of study:

- \* Journalism 28.500
- \* Journalism 28.520
- \* Journalism 28.522
- \* Journalism 28.526
- \* Journalism 28.528
- \* Journalism 28.541
- \* 1.0 credit of approved electives

First year M.J. candidates may be considered for advanced standing in certain of the above required courses, but in such cases will be required to replace waived courses with approved options.

### Second Year

Credits will be determined according to the stream pursued:

#### *Specialized Print Reporting*

- (i) Journalism 28.558
  - (ii) Journalism 28.570
  - (iii) Journalism 28.571
  - (iv) Journalism 28.576
  - (v) Journalism 28.598
  - (vi) 1.0 credit of approved electives in the student's area of specialization
- Note: Under special circumstances, and with the School's approval, a student could replace items (iv) and (v) and 0.5 credit elective in item (vi) above with a 2.0 credit M.J. Thesis, Journalism 28.599.

#### *Broadcast Journalism*

- (i) Journalism 28.558
  - (ii) Journalism 28.572
  - (iii) Journalism 28.573
  - (iv) Journalism 28.576
  - (v) Journalism 28.598
  - (vi) 1.0 credit of approved electives in the student's area of specialization.
- Note: Under special circumstances, and with the School's approval, a student could replace items (iv) and (v) and 0.5 credit elective in item (vi) above with a 2.0 credit thesis, Journalism 28.599.

#### *Journalism Studies*

- (i) Journalism 28.500
- (ii) Journalism 28.550
- (iii) Journalism 28.599

(iv) 2.0 credits related to the study of the media, chosen in consultation with the Supervisor of Graduate Studies.

## Academic Standing

All candidates are required to obtain a grade of B- or better in each credit in the program. A candidate may, with the recommendation of the School and the approval of the Dean of the Faculty of Graduate Studies and Research be allowed a grade of C+ in 1.0 credit.

Full-time students in a 10.0 credit M.J. program are advised that their thesis or research essay proposal must be formally approved within eighteen months of initial registration. Students in a 5.0 credit program must have the proposal formally approved by the middle of their second term of full-time registration. Due dates for part-time students will be adjusted accordingly. Students failing to file a proposal may not be permitted to register in subsequent terms until this requirement has been met. Approval of proposals shall be the responsibility of a thesis committee appointed by the Director of the School.

Students are advised to consult the General Regulations section of this Calendar for other regulations relating to academic standing.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

### First Year

Journalism 28.500F1 or W1

#### **Journalism and Society I**

An introduction to analysis of the news media in Western society, considering classical arguments and contemporary trends in the scholarly assessment of journalism practice.

Journalism 28.520F2

#### **Print Journalism Laboratory**

A laboratory course in basic reporting and editing techniques, followed by application in the print media.

Journalism 28.522W2

#### **Broadcast Journalism Laboratory**

A laboratory course in reporting and editing in the broadcast media.

Journalism 28.526F1, W1

### **Reporting Methods**

Topics covered will range from interviewing and observation skills to conducting a title search, lodging an access to information request and interpreting data.

Journalism 28.528F1, W1

### **Public Affairs Reporting**

A course devoted to understanding selected political, economic and social issues, and to analytical reporting on timely issues under professional conditions.

Journalism 28.535F1 or W1

### **Perspectives on Modern Society**

A seminar course examining texts from the social sciences, philosophy, literature, and journalism for the contribution they make to an understanding of issues facing modern industrial society.

Journalism 28.541F1 or W1

### **Journalism Law**

This course prepares journalists to function comfortably within the legal and ethical guidelines governing their occupation. Topics include: contempt of court; free press, fair trial; revealing of sources; civil defamation; obscenity; privacy; government secrecy.

## **Second Year**

Journalism 28.550F1, W1

### **Journalism and Society II**

A critical examination of the conduct of the news media, exploring the social, political and economic contexts in which the media work and assessing the consequences of journalism practice for contemporary society. Prerequisite: Journalism 28.500 or permission of the School.

Journalism 28.558F1, W1

### **Professional Practices: Specialized Media**

A workshop course designed to give students instruction in specialized areas such as radio documentary, video documentary, film documentary, editing, magazine writing, photojournalism. Not all specialties will be offered each year. Also offered at the undergraduate level, with different requirements, as Journalism 28.428\* for which additional credit is precluded.

Journalism 28.570T2

### **Advanced Reporting (Print)**

Students will explore and apply advanced journalistic principles and practices through a combination of readings, discussion and reporting in specific areas.

Journalism 28.571T2

### **Reporting and Online Publishing**

This course is designed to enhance reporting and editing skills through online publishing of electronic newspapers and/or newsmagazines.

Journalism 28.572T2

### **Television Journalism**

A seminar combining critical analysis of television journalism and practical skill development in television reporting, writing and production.

Journalism 28.573T2

### **Advanced Reporting (Broadcasting)**

Enhances television and radio reporting and production skills to include news features and mini-documentaries, preparation and presentation of public affairs programs, and multimedia delivery.

Journalism 28.576F1, W1

### **Professional Practices**

Students examine current journalism practices in a critical and analytical way, and explore ways of producing thorough and investigative journalism. Guest speakers share their expertise and skills.

Journalism 28.580F1 or W1

### **Survey Methods for Journalists**

An examination of basic research design and data collection with emphasis on problems of interpretation.

Journalism 28.588F1

### **Directed Readings**

Students, working under faculty direction, will undertake an intensive reading schedule in order to pursue a subject area of particular interest.

Journalism 28.589W1

### **Directed Research**

Students, working under faculty direction, will develop and undertake a research project in order to pursue a subject area of particular interest.

Journalism 28.590T2, S2

### **Directed Studies**

Reading and research tutorials.

Journalism 28.591F1, W1, S1

### **Directed Studies**

Reading and research tutorials.

Journalism 28.598F2, W2, S2

### **M.J. Research Project**

The student will complete a substantial piece of public affairs journalism; or a research project on the media; or a document that makes a major contribution to journalism education. The format of the MRP will be determined by the stream of study.

Journalism 28.599F4, W4, S4

### **M.J. Thesis**

To fulfill the requirements of this 2.0 credit thesis course, students must produce a major piece of journalistic research or complete an academic thesis in the area of journalism studies.

## Law

Loeb Building C473  
Telephone: 520-3690  
Fax: 520-4467

### The Department

**Chair of the Department**, Michael Mac Neil

**Supervisor of Graduate Studies**, Diana Majury

The Department of Law offers a program of advanced study and research leading to a Master of Arts degree in Legal Studies. The program is open to full-time and part-time students.

The Department also offers a Graduate Certificate in Conflict Resolution. Further information can be found at the end of this section. The M.A. program provides an interdisciplinary, theoretical, and research-oriented approach to studying law as a social and political institution, with emphasis on the relationship between law and social transformation. The plan of studies includes a range of fields linked by a common theoretical and methodological concern with the way law shapes and is shaped by its social environment. The program is designed to develop the conceptual and analytical skills required for conducting independent research on law and society.

Within this context, students will focus on one or more of the following areas of specialization:

- \* Legal Theory and Social Theory
- \* Law, Crime and Social Order
- \* Women, Law and Gender Relations
- \* Political Economy of Law
- \* International and Comparative Legal Regimes
- \* Social History of Law

The location of the M.A. program in Legal Studies at Carleton provides students with a wealth of resources for research purposes. As well as the resources of the MacOdrum Library, students will have access to extensive Canadian and international research material through the Social Science Data Archives located at Carleton. The Library of the Supreme Court of Canada, the National Library, the National Archives, the Library of Parliament, Statistics Canada, and the Centre for Justice Statistics are all located in Ottawa. Ottawa houses many federal government departments and agencies, as well as the national headquarters of non-governmental organizations such as the Elizabeth Fry Society, the John Howard Society, and the National Association of Women and the Law. Many government departments and non-governmental organizations maintain specialized libraries, and offer access to documents and other research materials.

### Qualifying -Year Program

Applicants with exceptional promise who have less than B.A.(Honours) status may be admitted into a qualifying-year program designed to raise their standing to honours status. To be considered for admission into the master's program, students must obtain at least a high honours average in their qualifying-year courses.

### Master of Arts

### Admission Requirements

The requirement for admission into the M.A. program in Legal Studies is an Honours bachelor's degree or the equivalent, with at least high honours standing.

Applicants will be considered for admission on the basis of their academic background and standing. Where relevant, previous professional experience may be taken into account.

Applicants without a background in law may be required to complete one or more designated courses, including Law 51.397: Legal Research Methods, from the department's undergraduate program before taking courses towards the master's degree.

The deadlines for submitting applications for graduate studies in the Legal Studies program are as follows: February 15 for students seeking financial assistance and June 1 for students not seeking financial assistance. If the program is able to consider applications for January admission, the applications are due November 1.

### Program Requirements

In consultation with the supervisor of graduate studies, each candidate is required to complete the following program of studies:

\* 3.0 credits

\* A thesis equivalent to 2.0 credits and an oral examination

All students are required to take Law 51.500 and 51.501. These courses provide students with a common theoretical and interdisciplinary framework for the program. The methods course is designed to develop the link between the theoretical orientation and the important research component of the program. Rather than seeking to provide all possible research skills, the course focuses on the importance of methodological issues and choices in research design.

In addition, students are encouraged to take 0.5 credit in a related discipline, in consultation with the supervisor of graduate studies.

All students must obtain satisfactory grades in their course work; make satisfactory progress in their research; maintain a close working relationship with their thesis supervisors; and attend seminars on current research and related topics. Each student will be required from time to time to present a seminar on his/her research.

## Thesis

The thesis must represent the result of the candidate's independent research undertaken after being admitted into graduate studies in the Department of Law. Previous work of the candidate may be used only as introductory or background material for the thesis.

A student may carry on research work related to the thesis off campus if the work is approved in advance and supervision arrangements have been made with the supervisor of graduate studies.

## Guidelines for Completion of Master's Degree

Full-time students are expected to complete the required two courses, Law 51.500 and Law 51.501, and an additional 2.0 credits by the end of the second term of registration. The thesis proposal should be submitted by the end of the sixth week of the second term of study. The thesis should be submitted by the end of the fourth term of study.

Part-time students are expected to complete the required two courses, Law 51.500 and 51.501, and an additional 2.0 credits by the end of their third year of study. The thesis proposal should be submitted by the end of the second month of the fourth year of study. The thesis should be submitted by the end of the fifth year of study.

## Certificate in Conflict Resolution

The Department of Law offers a program of advanced study leading to a Graduate Certificate in Conflict Resolution.

The Certificate provides an interdisciplinary program of study emphasizing theoretical models of conflict and its management and/or resolution, and integrating skills and techniques in the field. The program has an academic structure and a professional orientation, and is directed to individuals whose work involves negotiation or coping with conflict. The program develops in students an intellectual foundation and applied skills to enable them to function effectively in their field.

Interested students should contact the Department of Law for information concerning admission and program requirements, scheduled courses, and fee schedules.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

## Core Courses

The compulsory courses are designed to give substance to the major objectives of the program. They provide the theoretical and interdisciplinary framework which will set the terms of discussion and debate for the program. The courses are designated as compulsory because it is anticipated that students will be drawn from both law and social science backgrounds, and consequently there is a need to provide a central and shared basis for the whole program. The methods course is designed to develop the link between the theoretical orientation and the important research component of the program. Rather than seeking to provide all the research skills that students might require, the course focuses on the importance of methodological issues and choices in research design.

Law 51.500F1, W1 or S1

### Theories of Law and Social Transformation

Examines three groups of theories of law (liberal, sociological and Marxist) focusing on different ways law is conceived as an object of inquiry and on different accounts of trajectories of legal development. Potential of law for realizing or inhibiting social change provides analytic framework.

Law 51.501F1, W1 or S1

### Legal Method and Social Inquiry

Introduces problems of research strategy and methods. Explores contrasting methodologies in legal research; evaluates methodologies employed in understanding legal reasoning, discourses, and practices. Includes seminars in which participants present outlines of their own research projects, focusing on methodologies and research questions.

Law 51.599F4, W4, S4

### M.A. Thesis

## Other Law Courses

Law 51.502F1, W1 or S1

### Law and Gender Relations

Examines theoretical approaches informed by significance of gender to structure and operation of law. Concepts such as essentialism, dif-

ference, cultural determination, and social construction of gender relations examined in context of contemporary feminist debates. Focus on understanding and facility with feminist analysis and methodology.

Law 51.503F1,W1 or S1

**Law, Economy and Society**

Addresses the relationship between law, economy, and society. Competing theoretical accounts of the relationship between legal regulation and social and economic change explored through selected historical and contemporary case studies.

Law 51.504F1,W1 or S1

**Law, Crime and Social Order**

Examines theoretical dimensions of relationship between law, state, crime, and social order. Explores scope and limitations of criminal justice system as an agency of social control. Examines shifts in forms of social order and their relation to changes in criminal law and sanctions.

Law 51.505F1,W1 or S1

**Law, State and Politics**

Examines theoretical explanations of relationships between law, state and politics. Selected areas such as rights theory, rule of law, separation of powers or judicial review may provide focus.

Law 51.506F1,W1 or S1

**Historical Perspectives on Law and Society**

Examines historical relationship between social forces, law and legal institutions and utility of historical forms of knowledge and methods to legal studies. Surveys selected issues in private, public and criminal law.

Law 51.507F1,W1 or S1

**Race, Ethnicity and the Law**

Examines ways race and racism interact with gender and class in shaping legal system. Explores ways legal system institutionalizes racism and potential for using the legal system to combat racism. Selected areas such as immigration law and native rights may be used to illustrate themes.

Law 51.508F1,W1 or S1

**Consuming Passions: The Regulation of Consumption, Appearance and Sexuality**

Examines rise of consumption and private pleasures and their regulation and self-regulation. Social history of regulation of two fields of consumption: surfaces of the person: personal appearance, in particular of dress, the body, sexuality; and intakes of the body, focusing on food, alcohol, drugs. (Also listed as Sociology 53.524)

Law 51.510F1, W1 or S1

**Advanced Problems in Legal Philosophy**

Studies in legal theory and analyses of law advanced by Hart, Dworkin, and others, and

legal concepts: for example, principles, rights, duties, liability, etc. Precise course content will vary from year to year and will be announced at the beginning of the term. (Also listed as Philosophy 32.510).

Prerequisites: Either Law 51.315 or 51.311\* (Philosophy 32.311\*) and Law 51.312\* (Philosophy 32.312\*), or permission of the Department.

Law 51.520F1,W1 or S1

**International Economic Law: Regulation of Trade and Investment**

Study of regulation of international economic activity. Discussion of relevant international institutions, legal aspects of integration, governmental regulation of trade and investment. (Also listed as International Affairs 46.557)

Prerequisite: Open only to students in their master's year who have not studied international economic law.

Law 51.532F1,W1 or S1

**Feminism, Law and Social Transformation**

Exploration of nature and possibilities of feminist engagement with law. Policies and strategies of law reform and/or social transformation formulated and evaluated through application of theoretical frameworks to particular topics. Significance of Canadian Charter of Rights and Freedoms and human rights legislation is examined.

Law 51.535F1,W1 or S1

**Crime, Social Change and Criminal Law Reform**

Examination of the ideological and practical consequences of criminal law reform and policy initiatives undertaken by the state. Specific reform proposals examined to illustrate possible alternate responses to social problems and the varying effects of these responses.

Law 51.540F1,W1 or S1

**Law, Economy and the Regulatory Process**

Relationship between law, the economy, and the regulatory process. Examines models from political and economic perspectives, and impact of theories of regulation on regulatory practice and enforcement. Selected topics may be drawn from labour law, housing and consumer protection, environmental protection, and anti-combines legislation.

Law 51.545F1, W1 or S1

**Canadian Labour Law Policy from a Comparative Perspective**

Examines major influences on formation of Canadian labour law policy using a comparative perspective to highlight divergencies in Western democratic nations. Question if and why Canadian labour law is distinctive. Includes collective bargaining and regulation of individual employment relationships.

Law 51.550F1, W1 or S1

### **The Canadian Constitution**

Familiarizes students with terminology, principles, and doctrines of judicial interpretation of Constitution Acts 1867-1982 and other constitutional statutes. Emphasis on division of legislative powers in the Canadian federation.

Prerequisite: Open only to graduate students in their master's year who have not previously studied Canadian constitutional law.

Law 51.553F1, W1 or S1

### **Advanced Legal Problems of Federalism**

An advanced study of selected Canadian constitutional problems including constitutional revision. Some comparisons with other federal systems may be made.

Prerequisite: A course in Canadian constitutional law, for example Law 51.550, or permission of the Department.

Law 51.556F1, W1 or S1

### **Advanced Administrative Law Problems**

An in-depth study of selected legal questions involving the activities of public authorities.

Prerequisite: A course in administrative law or permission of the Department.

Law 51.563F1, W1 or S1

### **International Law: Theory and Practice**

Examines various theoretical perspectives on international law and locates role international law plays in the international system. Topics include basis, creation and sources of international law, international dispute resolution, and international law and world order transformation. (Also listed as International Affairs 46.555)

Law 51.590F1, W1 or S1

### **Tutorials/Directed Readings in Law**

Tutorials or directed readings in selected areas of law, involving presentation of papers as the basis for discussion with the tutor.

Law 51.591F1, W1 or S1

### **Tutorial/Directed Readings in Law**

Tutorials or directed readings in selected areas of law, involving presentation of papers as the basis for discussion with the tutor.

Law 51.593F1, W1 or S1

### **Contemporary Topics in Legal Studies**

A research seminar which explores a selected topic from current debates in legal studies. Students should check with the Department regarding the topic offered.

Law 51.594F1, W1 or S1

### **Contemporary Topics in Legal Studies**

A research seminar which explores a selected topic from current debates in legal studies.

## **Selection of Courses in Related Disciplines**

In addition to the graduate courses offered by the Department of Law, students in the M.A. program are encouraged to take 0.5 credit in a

related discipline, in consultation with the supervisor of graduate studies. Courses offered by other academic units which can be taken towards the requirements of the M.A. in Legal Studies are listed below. This list is not exhaustive and is subject to change.

In certain circumstances (with the approval of the supervisor of graduate studies) up to 1.0 credit may be selected from among those offered at the 400-level.

Note: Students should be aware that the number of spaces in graduate courses offered by other departments may be limited, and that registration may be conditional upon obtaining the prior approval of the department concerned. It is the student's responsibility to ensure that permission is obtained from the appropriate department prior to registering in any of the department's courses.

Students are advised that there is no guarantee that all of these courses will be offered in any given year, or in any given term. 1.0 credit courses are scheduled over two terms and students interested in these courses must consult the graduate supervisor. Students should check the current University timetable to ensure course availability and schedule when planning their program.

#### *Canadian Studies*

12.510, 12.520, 12.521

#### *Economics*

43.532, 43.533, 43.538, 43.543

#### *Geography*

45.540, 45.541, 45.544

#### *History*

24.526, 24.530, 24.559, 24.588

#### *International Affairs*

46.523, 46.536, 46.510, 46.535, 46.542, 46.545, 46.555, 46.557, 46.588

#### *Journalism and Communication*

28.541

#### *Political Science*

47.510, 47.557, 47.559

#### *Psychology*

49.514, 49.517, 49.522

#### *Public Administration*

50.502, 50.523, 50.536, 50.567, 50.568, 50.569, 50.584

#### *Sociology and Anthropology*

53.526, 53.530, 53.532, 53.536, 53.538, 53.540, 53.544, 53.545, 53.548, 53.549, 53.554, 53.560, 53.567, 53.568, 53.577,

#### *Social Work*

52.511, 52.516, 52.531, 52.532, 51.574

# Linguistics and Applied Language Studies

Paterson Hall 249  
Telephone: 520-2802  
Fax: 520-6641  
E-mail: linguistics@carleton.ca

## The School

**Director,** Ian Pringle

**Supervisor of Graduate Studies,** Devon Woods

The School of Linguistics and Applied Language Studies offers programs of study leading to the degree of Master of Arts in Applied Language Studies. Applied language studies may be distinguished by their focus on language learning, especially the acquisition of literacy and/or second languages, in a variety of contexts.

The program is geared largely towards practitioners in the field, and is aimed at enhancing their understanding of:

- \* discourse processes and social contexts for language use
- \* first and/or second language acquisition and development
- \* educational contexts for and testing of such acquisition

Concentration is possible in one of the following three fields:

- \* English as a second language
- \* the acquisition and development of writing abilities
- \* adult literacy

In addition, individual programs may be drawn up for students who are interested in the connection among any of these three fields.

Additional information may be obtained by consulting the supervisor of graduate studies.

## Qualifying-Year Program

Applicants who hold a 3 year degree with honours standing (at least *B* overall) may be admitted to the qualifying-year program. Normally, these students will be required to complete 5.0 credits in accordance with the advice of the graduate supervisor. At the end of the qualifying-year program, the School will determine the student's eligibility to enter the master's program.

## Master of Arts

### Admission Requirements

The normal requirement for admission to the master's program is a B.A.(Honours) degree in

a discipline involving the analysis of language or the study of language use or learning; or a 3 year B.A. in a relevant discipline together with a B.Ed. or C.T.E.S.L. Students must have achieved high honours standing (at least *B+* in related courses and *B-* overall) in their academic work. Relevant professional experience is also seriously considered in admissions decisions. In some cases substantial professional experience and related professional development may be accepted as an alternative to certain formal academic work. Students whose previous studies include little work relevant to applied language studies may be required to take up to two additional 1.0 credit courses for the master's degree.

## Program Requirements

Students will establish their programs in consultation with an adviser from the School.

Each candidate will select one of the following program paths:

\* Linguistics and Applied Language Studies 29.552; 29.501; plus 2.0 credits from the School's graduate listing; and a master's thesis (29.599).

\* Linguistics and Applied Language Studies 29.552; 29.501; plus 3.0 credits from the School's graduate listing; and a research essay (29.598).

\* Linguistics and Applied Language Studies 29.552; 29.501; plus 4.0 credits from the School's graduate listing.

The choice of thesis, research essay, or credit program path will be made by the student, with the advice of the Supervisor. Relevant factors will include the student's academic goals, professional goals, and background knowledge.

Linguistics and Applied Language Studies 29.501 is normally to be taken in the first fall term after admission to the program.

Permission may be granted for enrollment in 1.0 credit offered in another department.

Graduate students may take the equivalent of 1.0 full credit at the senior undergraduate level, with the permission of the School adviser.

## Guidelines for Completion of Master's Degree

It is expected that students will progress steadily towards the completion of requirements for the degree. In particular, it is normally expected that:

- \* a full-time student will complete 3.0 credits of course work within two terms of study, and

an acceptable thesis proposal early in the third term of study; or 4.0 credits of course work within three terms, and an acceptable research essay proposal early in the fourth term; and all degree requirements within six terms of study

\* a part-time student will complete 3.0 credits of course work within three years of initial registration, and an acceptable thesis proposal early in the fourth year; or 4.0 credits of course work within four years, and an acceptable research essay proposal early in the fifth year; and all degree requirements within six years of initial registration

\* a student who registers in a combination of full-time and part-time study will, in consultation with an adviser, develop a schedule for completion of course requirements and a thesis or research essay proposal, consistent with times to completion stated above and with the overall time limits specified in the General Regulations section in this Calendar

## Academic Standing

A standing of B- or better must be obtained in each credit counted towards the master's degree.

## Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

Linguistics and Applied Language Studies 29.501F1 or W1 or S1

### Directions in Applied Language Studies

A survey of current research directions in applied language studies and an introduction to ongoing research in the School. The course introduces students to the scope of theory and practice in the field.

Linguistics and Applied Language Studies 29.521F1 or W1 or S1

### Language Classroom Research

Research into language learning in the classroom; methods for evaluating classroom practices and materials.

Linguistics and Applied Language Studies 29.522F1 or W1 or S1

### Curriculum Design in ESL

Current theory and practice in ESL curriculum design in the light of recent research in linguistics, psycholinguistics, sociolinguistics, and language acquisition studies.

Linguistics and Applied Language Studies 29.523F1 or W1 or S1

### Issues in English Language Teaching/Teacher Education

A research seminar to explore current issues in English Language teaching/teacher education.

Linguistics and Applied Language Studies 29.541F1 or W1 or S1

### Rhetoric and Argument in the Human, Social and Natural Sciences

The degree to which rhetorical considerations shape the construction of arguments within disciplinary communities. How disciplinary and socio-historical conditions shape scientific communities' criteria for what is accepted as persuasive. Also offered at the undergraduate level, with different requirements, as Linguistics and Applied Language Studies 29.441★, for which additional credit is precluded.

Linguistics and Applied Language Studies 29.542F1 or W1 or S1

### Learning Across the Disciplines: A Research Practicum

For practising teachers or graduate student teachers, or tutors. Theories about and research into the role of language in learning and pedagogic situations which optimize that relationship. Also offered at the undergraduate level, with different requirements, as Linguistics and Applied Language Studies 29.442★, for which additional credit is precluded.

Linguistics and Applied Language Studies 29.543F1 or W1 or S1

### Language in the Classroom

Learning through language; studies of the use of language (as a resource for education) in the classroom; methods for evaluating the effectiveness of classroom discourse practices.

Linguistics and Applied Language Studies 29.545F1 or W1 or S1

### Written Language, Representation and Cognition

Language and thought; social formation of mind and language; written and spoken discourse compared; models and taxonomies of written discourse; modes (narrative, exposition, argument) in traditional rhetoric and contemporary research; concepts of function and levels of abstracting.

Precludes additional credit for Linguistics and Applied Language Studies 29.563 (taken prior to 1997-98).

Linguistics and Applied Language Studies 29.551F1 or W1 or S1

### Language Testing

Methods for the development of tests; analytic techniques, including classical and IRT methods; research in test-taking and test evaluation.

Linguistics and Applied Language Studies  
29.552F1 or W1 or S1

**Inquiry Strategies in Applied Language Studies**

A consideration of various approaches to the design of studies and the collection and analysis of data. Naturalistic and quasi-experimental methods will be discussed. The role of statistics in disciplined inquiry, including an introduction to elementary procedures.

Linguistics and Applied Language Studies  
29.554F1 or W1 or S1

**Evaluation in Applied Language Programs**

An examination of various evaluation paradigms and their application to problems of program and curriculum in applied language settings; the connections among and differences between research and evaluation models of inquiry.

Linguistics and Applied Language Studies  
29.558F1 or W1 or S1

**Critical Applied Linguistics**

Approaches and methods of critical applied linguistics, including historical analysis, accounts and narratives, and discourse analysis. Application to areas such as language and gender, language in education and language policy. Prerequisite: Honours courses in linguistics or permission of the School.

Linguistics and Applied Language Studies  
29.561F1 or W1 or S1

**Language Acquisition**

Current models of first and second language acquisition, with emphasis on empirical studies. Also offered at the undergraduate level, with different requirements, as Linguistics and Applied Language Studies 29.462★, for which additional credit is precluded.

Linguistics and Applied Language Studies  
29.564F1 or W1 or S1

**Aspects of Language Development**

Empirical study of the development of syntax and the expansion of communicative competence during the years of formal education; pedagogical implications.

Linguistics and Applied Language Studies  
29.565F1 or W1 or S1

**Writing Research and Theory: Overview of Recent and Current Approaches**

Overview of trends and directions in composition research and theory since the 1970s, from the reinvention of rhetorical theory, to the application of cognitive models in research on composing, and the more recent importation of social constructivist paradigms.

Linguistics and Applied Language Studies  
29.566F1 or W1 or S1

**Adult Literacy Acquisition**

Studies of adult literacy learners; theories of adult learning; relations between literacy and other linguistic abilities; pedagogical implications.

Linguistics and Applied Language Studies  
29.571F1 or W1 or S1

**Aspects of Bilingualism**

Aspects of the psycholinguistics and sociolinguistics of bilingualism.

Prerequisite: Honours courses in linguistics or permission of the School.

Linguistics and Applied Language Studies  
29.573F1 or W1 or S1

**Academic and Workplace Genres**

Overview of current reconceptualizations of genre as social action; recent research into the nature of school-based, professional, and workplace discourse; issues relating to genre acquisition and pedagogy.

Linguistics and Applied Language Studies  
29.574F1 or W1 or S1

**Research in Adult Literacy**

Studies in adult reading; methods of identifying adult reading needs; sociolinguistics of adult reading.

Linguistics and Applied Language Studies  
29.575F1 or W1 or S1

**Second Language Writing: Research and Theory**

Second language writing: research, theory, and pedagogy.

Linguistics and Applied Language Studies  
29.576F1 or W1 or S1

**Writing Research and Theory: Social and Cultural Dimensions**

Recent research in the social and cultural dimensions of learning to read and write; the uses and impact of written discourse in social contexts; writing in modern societies; the impact of electronic technology.

Precludes additional credit for Linguistics and Applied Language Studies 29.572 (taken prior to 1997-98).

Linguistics and Applied Language Studies  
29.577F1 or W1 or S1

**Language Policy and Planning**

Analysis of interaction of political, social and cultural factors in the planning and implementation of language policy, with particular emphasis on the case of English in a selection of socio-political contexts.

Prerequisite: Honours courses in linguistics or permission of the School.

Linguistics and Applied Language Studies  
29.592F1 or W1 or S1

**Tutorial in Applied Language Studies**

A one-term tutorial to study applications of linguistics in such areas as first-language education and second-language teaching.

Linguistics and Applied Language Studies  
29.595F1 or W1 or S1

**Special Topics in Applied Language Studies**

Exploration of a topic from current research in applied language studies. Students should check with the School regarding the topic addressed in any term.

Linguistics and Applied Language Studies  
29.597T2

**Tutorial in Applied Language Studies**

A two-term tutorial to study applications of linguistics in such areas as first-language education and second-language teaching.

Linguistics and Applied Language Studies  
29.598F2 or W2 or S2

**Research Essay**

Linguistics and Applied Language Studies  
29.599F4 or W4 or S4

**M.A. Thesis**

## Mass Communication

St. Patrick's Building 310  
Telephone: 520-7408  
Fax: 520-6690

### The Program

**Associate Director**, To be announced

**Supervisor of Graduate Studies**, To be announced

### Master of Arts

The Mass Communication program of the School of Journalism and Communication offers a program of studies leading to a Master of Arts degree in Communication. Courses covering four areas of concentration are offered:

- \* the history of communication and media systems
- \* communication/information technologies and society
- \* communication and social relations
- \* communication policy and political economy

Additional information may be obtained by consulting the supervisor of graduate studies.

### Qualifying-Year Program

Applicants who lack an Honours degree, but have a 3 year degree with honours standing (a minimum B standing overall) may be considered for admission to a qualifying-year program. Students who complete the qualifying year with high honours standing may be considered for admission to the master's program in the following year. Refer to the General Regulations section of this Calendar for regulations governing the qualifying year.

### Admission Requirements

The minimum requirement for admission to the master's program is a B.A.(Honours) degree or the equivalent, with high honours standing in communication or a related discipline. Related disciplines may include sociology, political science, film studies, and Canadian studies.

Applicants without a background in communication studies may be required to take certain designated courses from the undergraduate mass communication program in addition to their regular program.

Possession of the minimum entrance standing is not in itself, however, an assurance of admission into the program.

### Program Requirements

Each student, in consultation with the supervisor of graduate studies, will be required to follow a thesis or a non-thesis program for a total of 5.0 credits. Two of the four areas of concentration must be chosen.

In selecting their program of studies, all students will be required to take Communication 27.511. Students may take one optional course (1.0 credit) outside the program, with permission of the supervisor of graduate studies.

All master's students are required to complete:

- \* Communication 27.511
- \* 1.0 credit selected from: Communication 27.521, 27.523, 27.525, 27.531
- \* a thesis (2.0 credits) and 1.0 credit from the list of optional courses below, or a research essay (1.0 credit) and 2.0 credits chosen from the list of optional courses

### Optional Courses

- \* Communication 27.555
- \* Communication 27.556
- \* Communication 27.557
- \* Communication 27.558
- \* Communication 27.559
- \* Communication 27.565
- \* Communication 27.589
- \* Communication 27.590

*Note:* Students may take up to 1.0 credit outside the program with permission of the supervisor of graduate studies.

### Academic Standing

A standing of B- or better must be obtained in each credit counted towards the master's degree.

### Doctor of Philosophy

The School of Journalism and Communication offers a program of studies leading to the Doctor of Philosophy degree in Communication. The program focuses on three fields of concentration:

- \* The history of communication
- \* The political economy of communication
- \* The socio-cultural analysis of communication

### Admission Requirements

The normal requirement for admission into the doctoral program is a master's degree (or the equivalent) in communication or a cognate field such as journalism studies, with an overall average of B+ or better.

Applicants who have deficiencies in certain areas may be admitted to the Ph.D. Program, but will normally be required to complete additional course work.

## Program Requirements

Doctoral candidates must successfully complete the equivalent of 10.0 credits. The specific requirements are as follows:

- \* Communication 27.600 (1.0 credit)
- \* 2.0 additional credits from the list of optional courses below; up to 1.0 credit may be taken in a relevant discipline outside of the School
- \* Comprehensive examinations (2.0 credits)
- \* A thesis (5.0 credits) which must be defended at an oral examination
- \* A language requirement as stated below

## Optional Courses

All doctoral candidates must complete 2.0 credits of optional courses from the list of approved options below. Students are encouraged to take up to 1.0 credit from courses offered in other departments, particularly those that address central theoretical and/or methodological issues within the student's chosen field of concentration. Students are also encouraged to choose directed readings/research courses with the core faculty of the program.

- \* Communication 27.521
- \* Communication 27.523
- \* Communication 27.525
- \* Communication 27.531
- \* Communication 27.555
- \* Communication 27.556
- \* Communication 27.557
- \* Communication 27.558
- \* Communication 27.559
- \* Journalism 28.541
- \* Journalism 28.550

## Comprehensive Examinations

Once doctoral candidates have successfully completed all course requirements, maintaining a GPA of 9.0 or better, they will proceed to the comprehensive examinations. The comprehensive requirement normally consists of two examinations equivalent to 2.0 credits. Both examinations must normally be completed no later than two years or six terms after initial full-time registration, or four years or 12 terms after initial part-time registration. Students who do not fulfill this requirement may be asked to withdraw from the program.

The first examination tests the student's mastery of the theoretical, methodological and substantive issues of the discipline as a whole. Students complete a written examination, covering all three fields of specialization in the program, which will be determined and graded by the instructors of Communication 27.600. Submission of the written examination is followed by a comprehensive oral examination, which is not restricted to issues raised by the written portion. Students who fail the examination will normally be asked to withdraw from the program.

The second examination tests the student's knowledge of one field of specialization. The student normally will write answers to a set of field questions and will defend these answers before the student's advisory committee.

## Language Requirement

Students are required to demonstrate an understanding of a language other than English, preferably French. Language testing will be administered by the School and will normally include a demonstration of reasonable understanding, on sight, of material contained in selected samples of scholarly literature in a foreign language and in the field of communication.

## Thesis Requirement

A thesis proposal is presented after the comprehensive requirement has been satisfied, and defended at an oral presentation. The thesis, normally equivalent to 5.0 credits, must be successfully defended at an oral examination.

## Academic Standing

A standing of B- or better must be obtained in each course counted towards the Ph.D. Degree. Students are advised to consult the General Regulations section of the Graduate Calendar for details of regulations governing graduate programs.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit.

Communication 27.511T2

**Foundations of Communication Studies**

This course undertakes an examination of the historical emergence of communication studies. It deals with the methodological debates which have occurred between various schools over the competing definitions of communication, and over the broader question of the centrality of communication to society.

Communication 27.521F1 or W1

**History of Social Communication**

A historical examination of the institutions, practices, and media of communication in various social milieux.

Communication 27.523F1 or W1

**Communication Technology and Society**

The course examines the social and cultural significance of communication and information technology (e.g., computers, television, telecommunication). It examines how these technologies influence and are influenced by major social institutions (e.g., business, government, entertainment) and by cultural practices.

Communication 27.525F1 or W1

**Communication and Social Relations**

This course studies how communication practices reproduce relations of inclusion and exclusion. It explores theoretical contributions to notions of public sphere, civil society, and citizenship. These issues are examined at the transnational level and are studied by looking at Orientalism and globalism.

Communication 27.531F1 or W1

**Communication Institutions, Cultural Industries and State Policy**

This course introduces various approaches to understanding communication policy and the political economy of communication. The course focuses on recent transformations in the communication industries, the impact of new technology, and changes in how governments intervene in the communications field.

Communication 27.555F1 or W1

**Communication Media**

A research seminar which focuses critically upon one of the communication media (such as radio, television, film, telecommunications, publishing, etc.) with a view to understanding its history, forms and genres, and social uses.

Communication 27.556F1 or W1

**International Communication**

This course explores communication in a global context. It looks at the New World Information and Communication Order debate, structures and regulation of transborder communication, and broadcasting and news flows. Resistance to cultural imperialism and the emergence of diasporic networks of communication are also studied.

Communication 27.557F1 or W1

**History of Canadian Broadcasting**

A topical and thematic examination of selected aspects of the history of Canadian broadcasting, such as structure, regulation, technology, commercialism, social impact, audience research, and areas of programming such as drama, news, political and controversial broadcasts, and Northern broadcasting.

Communication 27.558F1 or W1

**Mass, Public, Audience**

This course examines the emergence and evolution of conceptions of modern social organization through the key concepts of mass, public, and audience. It looks at how shifts in the understanding of social organization occur, how these shifts are theorized, and the implications for communication study.

Communication 27.559F1 or W1

**Media, Culture and Gender**

This course examines the various theoretical positions which underlie the debates on the production and reproduction of gender relations through communication processes and communication institutions. It addresses current research issues in the feminist debates on culture and communication.

Communication 27.565F1 or W1

**Special Topics in Communication Research**

The course considers a variety of research protocols and procedures which may include: research organization; documentary research techniques; strategies in textual analysis, including content analysis and thematic analysis; qualitative techniques, including interviewing, observation, and ethnography; quantitative methods, including questionnaires, coding procedures, and statistical analysis.

Communication 27.589F1, W1, S1

**Directed Research**

The student, working under faculty direction, will develop and undertake a research project in order to study a particular subject area.

Communication 27.590F1, W1, S1

**Directed Studies**

Tutorials or directed readings in selected areas of communication. The student will present papers as the basis for discussion with the tutor.

Communication 27.598F2, W2, S2

**Research Essay**

Communication 27.599F4, W4, S4

**M.A. Thesis**

Communication 27.600T2

**Doctoral Seminar in Communication Studies**

The course examines major schools of thought in the field and leading theoretical and meth-

odological debates, with an emphasis on the three fields of concentration in the program: the history of communication, the political economy of communication, and the socio-cultural analysis of communication.

Communication 27.601F1 or W1

**Selected Topics in Communication**

A seminar offered from time to time in one of the three fields of concentration. The topics for 2001-2002 are:

**The Political Economy of Communication.** This seminar covers the major research traditions in political economy, addresses the history of their use in the study of communication media and information technologies, and critically evaluates current research in the political economy of communication, particularly its relationship to policy analysis.

**The Politics of Seeing and Remembering: The Making of Modern Communication.** This seminar examines the political and socio-cultural conditions from which emerged 'new' communication technologies which helped to standardize the ways of seeing and remembering. It discusses how developing forms of visualization and representation shaped the construction of popular culture, collective memory and political resistance.

Communication 27.602F1, W1, S1

**Tutorial in Communication**

A tutorial in one of the fields of concentration of the program.

Communication 27.603F1, W1, S1

**Directed Research**

The student, working under faculty direction, will develop and undertake a research project in order to study a particular subject area.

Communication 27.604F1, W1, S1

**Directed Studies**

Directed readings in selected areas of communication. The student will present papers as the basis for discussion with the tutor.

Communication 27.690F2, W2, S2

**Ph.D. Tutorial**

A tutorial specifically designed as preparation for the first or breadth comprehensive examination, under the direction of two or more faculty members. The grade to be awarded will be that obtained on both the written examination and the oral defense.

Communication 27.691F2, W2, S2

**Ph.D. Tutorial**

Working under the direction of three or more faculty members, the selected tutorial provides preparation for the second or depth comprehensive examination. The grade to be awarded is that obtained in the second comprehensive examination.

Communication 27.699F10, W10, S10

**Ph.D. Thesis**

**Selection of Courses in Related Disciplines**

In addition to courses offered by the Mass Communication program, the following courses may, with the prior approval of the supervisor of graduate studies, be used to complete program requirements. This list is not exclusive and is subject to change. Students should be aware that enrolment in these courses may be limited and that registration may be conditional upon obtaining prior approval of the department concerned.

**Note:** It is the responsibility of the student to ensure that permission is obtained from the appropriate department prior to registering in any of the department's courses.

*Canadian Studies*

12.510, 12.520, 12.530

*Economics*

43.533

*Geography*

45.543

*Journalism and Communication*

28.500, 28.550

*Political Economy*

44.500, 44.501

*Political Science*

47.403

47.504, 47.541

*Sociology*

53.525, 53.536, 53.538, 53.539, 53.554, 53.555

# Ottawa-Carleton Institute of Mathematics and Statistics

Herzberg Building 4314

Telephone: 520-2152

Fax: 520-3536

E-mail: mathstat@carleton.ca

Université d'Ottawa  
University of Ottawa



Carleton University

## The Institute

**Director of the Institute,** Sam Melkonian

**Associate Director,** Philip Scott

Students pursuing studies in pure mathematics, applied mathematics, probability and statistics at the graduate level leading to a M.Sc. or a Ph.D. degree do so in a joint program offered by the School of Mathematics and Statistics at Carleton University and the Department of Mathematics and Statistics at the University of Ottawa under the auspices of the Ottawa-Carleton Institute of Mathematics and Statistics. The Institute is responsible for supervising the programs, regulations, and student admissions, as well as providing a framework for interaction between the two departments at the research level.

The list below of all members of the Institute along with their research interests can be used as a guide to possible supervisors.

In addition to the programs administered by the Institute, the School of Mathematics and Statistics at Carleton University offers several other programs.

In cooperation with the Department of Epidemiology and Community Medicine at the University of Ottawa, students may pursue a program leading to an M.Sc. with a Specialization in Biostatistics. For information, see p.91.

In cooperation with the Department of Systems and Computer Engineering and the School of Computer Science at Carleton University, students may pursue a program leading to an M.Sc. in Information and Systems Science. For information see p.209.

Requests for information and completed applications should be sent to the Director or Associate Director of the Institute.

## Members of the Institute

The home department of each member of the Institute is indicated by (C) for the School of Mathematics and Statistics, Carleton University and (UO) for the Department of Mathematics and Statistics, University of Ottawa

- N.U. Ahmed, *Nonlinear Functional Analysis, Control Theory* (UO)

- Mayer Alvo, *Nonparametric Statistics, Sequential Analysis* (UO)
- Y. Billig, *Algebra* (C)
- Amitava Bose, *Stochastic Modelling, Probability Theory* (C)
- W.D. Burgess, *Algebra, Non-Commutative Rings* (UO)
- Charles Castonguay, *Demography* (UO)
- M.P. Closs, *Native American Mathematics* (UO)
- Miklós Csörgő, *Probability and Statistics* (C)
- A.R. Dabrowski, *Invariance Principles, Weakly Dependent Variables* (UO)
- Daniel Daigle, *Algebraic Geometry, Commutative Algebra* (UO)
- D.A. Dawson, *Stochastic Processes and Probability Theory* (C)
- Benoit Dionne, *Ordinary Differential Equations, Bifurcation Theory* (UO)
- J.D. Dixon, *Group Theory, Algebra Computation* (C)
- Vlastimil Dlab, *Finite Dimensional Algebras, Representation Theory* (C)
- P. Farrell, *Sampling, Discrete Data, Applied Statistics* (C)
- Che-Kao Fong, *Operator Theory* (C)
- Zhicheng Gao, *Graph Theory* (C)
- C.W.L. Garner, *Foundations of Geometry* (C)
- Thierry Giordano, *Operator Algebras, Ergodic Theory* (UO)
- D.E. Handelman, *K-theory, Operator Algebras, Ring Theory* (UO)
- Roger Herz-Fischler, *History and Sociology of Mathematics* (C)
- B.G. Ivanoff, *Probability, Point Processes, Martingales* (UO)
- W. Jaworski, *Probability* (C)
- Barry Jessup, *Rational Homotopy* (UO)
- Daniel Krewski, *Applied Statistics in Medicine* (C)
- E.O. Kreyszig, *Partial Differential Equations, Numerical Analysis* (C)
- L.E. May, *Numerical Analysis* (C)
- D.R. McDonald, *Applied Probability* (UO)
- Sam Melkonian, *Non-linear Differential Equations* (C)
- S.E. Mills, *Applied Statistics, Statistical Methods, Inference* (C)

- A.B. Mingarelli, *Ordinary Differential Equations, Difference Equations* (C)
- M. Mojrshuibani, *Resampling, Classification and Pattern Recognition* (C)
- B.C. Mortimer, *Group Theory, Coding Theory* (C)
- Erhard Neher, *Jordan Algebras* (UO)
- L.D. Nel, *Nonnormable Analysis and Calculus* (C)
- D. Panario, *Finite Fields, Combinatorics, Analysis of Algorithms* (C)
- J.N. Pandey, *Generalized Functions, Partial Differential Equations* (C)
- J.C. Poland, *Group Theory* (C)
- I.S. Pressman, *Optimization, Algebra* (C)
- Michel Racine, *Jordan Algebras* (UO)
- Mizanur Rahman, *Special Functions* (C)
- J.N.K. Rao, *Sample Surveys Theory and Methods* (C)
- Luis Ribes, *Group Theory* (C)
- R.B. Richter, *Graph Theory, Combinatorics* (C)
- Ivan Rival, *Combinatorics, Algorithms* (UO)
- Wulf Rossmann, *Lie Groups* (UO)
- Damien Roy, *Number Theory* (UO)
- A.K. Md. E. Saleh, *Order Statistics, Mathematical Statistics* (C)
- Iona Schioppa-Kratina, *Probability Theory, Stochastic Processes* (UO)
- P.J. Scott, *Logic, Category Theory* (UO)
- Barbara Szyszkowicz, *Statistics* (C)
- Remi Vaillancourt, *Partial Differential Equations, Numerical Methods* (UO)
- K. S. Williams, *Number Theory* (C)
- Y. Zhao, *Applied Probability* (C)

## Master of Science

### Admission Requirements

The normal requirement for admission to the master's program is an Honours bachelor's degree in mathematics, or the equivalent, with at least high honours standing. Applicants holding a general (3 year) degree with at least high honours standing may be admitted to a qualifying-year program.

Their subsequent admission to the regular master's program depends on their performance during the qualifying-year program and will be decided no later than one year after admission

to the qualifying-year program. Details are outlined in the general section of this calendar. Students with outstanding academic performance and research promise while in the M.Sc. program may be permitted to transfer to the Ph.D. program without completing the M.Sc. program.

Special consideration may be given, for acceptance in the high-technology concentration, to graduates in computer science or engineering with a strong mathematical background and work experience in the high-technology sector.

### Program Requirements

The two options for the M.Sc. program are:

- \* 2.5 credits and a thesis
- \* 4.0 credits

The courses must be chosen from those at the graduate level except that a student may take up to 1.0 credit of undergraduate courses at the 400-level to satisfy these requirements. Not all these courses may be taken in the same field of mathematics; at least 1.0 credit must be in another field. All master's students are required to participate actively in a seminar or project under the guidance of their adviser. A maximum of 1.0 credit taken outside of the School of Mathematics and Statistics at Carleton University or the Department of Mathematics and Statistics at the University of Ottawa may be allowed for credit.

Students who plan to specialize in probability or statistics are strongly advised that during their master's program they include, where possible, the courses 70.560, 70.551 in mathematical statistics; 70.452, 70.555 in applied statistics, and 70.451, 70.571 in probability, together with 1.0 credit further in the School of Mathematics and Statistics. In addition, a graduate course in another field, such as biology, biostatistics, economics, computer science, systems analysis, and stochastic modelling, is highly recommended.

### High-Technology Concentration in the M.Sc.

An M.Sc. with a high-technology concentration is available. This concentration is intended for mathematics graduates interested in employment in the high technology area; it is also intended for science or engineering graduates currently employed in the high-technology area who require a greater understanding of mathematics for their work. The course requirement for the high-technology designation on a student's transcript is completion of a minimum of six courses selected from the list of high-technology courses authorized by the Director of the Institute. Each student will be assigned an advisor who will be responsible for approving course selection.

## Doctor of Philosophy

### Admission Requirements

The normal requirement for admission to the Ph.D. program is a master's degree in mathematics, or the equivalent, with at least high honours standing. Details are outlined in the General Regulations section of this Calendar.

### Program Requirements

The course requirements, which are determined at the time of admission, include a minimum of 3.0 credits and a suitable thesis. Not all of these courses may be taken in the same field of mathematics; at least 1.0 credit must be in another field.

All candidates must take comprehensive examinations, and satisfy a language requirement. The language requirement is determined by the candidate's advisory committee and normally requires the ability to read mathematical literature in a language considered useful for his/her research or career, and other than the candidate's principal language of study.

Students specializing in *mathematics* or *probability* undertake a comprehensive examination in the following areas:

- \* The candidate's general area of specialization at the Ph.D. level
- \* Examinations on two topics chosen from algebra, analysis, probability, topology, and statistics. (This choice excludes the student's specialty.)

Students specializing in *statistics* must write an examination in the following areas:

- \* Mathematical statistics which includes multivariate analysis
- \* An examination in probability, and
- \* An examination in either (i) applied statistics, or (ii) analysis

In all cases, the examination must be completed successfully within twenty months of initial registration in the Ph.D. program in the case of full-time students, and within thirty-eight months of initial registration in the case of part-time students.

All Ph.D. candidates are also required to undertake a final oral examination on the subject of their thesis.

### Selection of Courses

The following undergraduate courses may, with the approval of the School of Mathematics and Statistics, be selected by master's candidates in partial fulfillment of their degree requirements:

#### *Mathematics and Statistics*

- 70.401 Vector Calculus
- 70.415 Rings and Modules
- 70.417 Commutative Algebra
- 70.427 Foundations of Geometry
- 70.428 Introduction to Differentiable Manifolds
- 70.445 Analytical Dynamics
- 70.446 Hydrodynamics and Elasticity
- 70.447 Tensor Analysis and Relativity Theory
- 70.451 Probability Theory
- 70.452 Sampling: Theory and Methods
- 70.453 Applied Multivariate Analysis
- 70.456 Non-Parametric Methods
- 70.458 Stochastic Models
- 70.459 Stochastic Optimization
- 70.472 Integral Transforms
- 70.473 Qualitative Theory of Ordinary Differential Equations
- 70.482 Introduction to Mathematical Logic
- 70.483 Topics in Applied Logic
- 70.484 Design and Analysis of Algorithms
- 70.486 Numerical Analysis
- 70.488 Graph Theory and Algorithms

### Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions* and *Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Mathematics 70.501W1 (MAT5120)

#### **Abstract Measure Theory**

Abstract measure and integral, L-spaces, complex measures, product measures, differentiation theory, Fourier transforms.

Prerequisite: Mathematics 70.407 ★.

Mathematics 70.503F1 (MAT5122)

#### **Banach Algebras**

Commutative Banach algebras; the space of maximal ideals; representation of Banach algebras as function algebras and as operator algebras; the spectrum of an element. Special types of Banach algebras: for example, regular algebras with involution, applications.

Mathematics 70.504F1 (MAT5129)

### **Integral Equations**

A survey of the main results in the theory of non-singular linear integral equations; Volterra and Fredholm equations of first and second kind in the  $L_2$  case, with special results for the continuous case; Hermitian kernels; eigen-function expansions; compact operators. Prerequisites: Mathematics 70.302 ★ and 70.403 ★.

Mathematics 70.505F1 (MAT5127)

### **Complex Analysis**

Complex differentiation and integration, harmonic functions, maximum modulus principle, Runge's theorem, conformal mapping, entire and meromorphic functions, analytic continuation.

Mathematics 70.506F1 (MAT5316)

### **Topological Vector Spaces**

Construction of new topological vector spaces out of given ones; local convexity and the Hahn-Banach theorem; compactness and the Krein-Milman theorem; conjugate spaces, polar sets. Prerequisite: Mathematics 70.403 ★.

Mathematics 70.507F1 (MAT5125)

### **Real Analysis I (Measure Theory and Integration)**

General measure and integral, Lebesgue measure and integration on  $\mathbb{R}$ , Fubini's theorem, Lebesgue-Radon-Nikodym theorem, absolute continuity and differentiation,  $L^p$ -spaces. Selected topics such as Daniell-Stone theory. Also offered, with different requirements, as Mathematics 70.407 ★ for which additional credit is precluded.

Prerequisites: Mathematics 70.301 ★ and 70.302 ★ (MAT3125) or permission of the Department.

Mathematics 70.508W1 (MAT5126)

### **Real Analysis II (Functional Analysis)**

Banach and Hilbert spaces, bounded linear operators, dual spaces. Topics selected from: weak-topologies, Alaoglu's theorem, compact operators, differential calculus in Banach spaces, Riesz representation theorems. Also offered, with different requirements, as Mathematics 70.403 ★ for which additional credit is precluded.

Prerequisite: Mathematics 70.507 (MAT5125) or permission of the Department.

Mathematics 70.509F1 (MAT5121)

### **Introduction to Hilbert Space**

Geometry of Hilbert Space, spectral theory of linear operators in Hilbert Space. Prerequisites: Mathematics 70.301 ★, 70.302 ★, and 70.403 ★.

Mathematics 70.512F1 (MAT5148)

### **Group Representations and Applications**

An introduction to group representations and character theory, with selected applications.

Mathematics 70.513F1 (MAT5146)

### **Rings and Modules**

Generalizations of the Wedderburn-Artin theorem and applications, homological algebra.

Mathematics 70.514F1 (MAT5143)

### **Lie Algebras**

Basic concepts; ideals, homomorphisms, nilpotent, solvable, semi-simple. Representations, universal enveloping algebra. Semi-simple Lie algebras: structure theory, classification, representation theory.

Prerequisites: Mathematics 70.517 (MAT5141) and 70.519 (MAT5142) or permission of the Department.

Mathematics 70.516W1 (MAT5145)

### **Group Theory**

Fundamental principles as applied to abelian, nilpotent, solvable, free, and finite groups; representations. Also offered, with different requirements, as Mathematics 70.416 ★, for which additional credit is precluded.

Prerequisite: Mathematics 70.310 or permission of the Department.

Mathematics 70.517F1 (MAT5141)

### **Algebra I**

Groups, Sylow subgroups, finitely generated abelian groups. Rings, field of fractions, principal ideal domains, modules. Polynomial algebra, Euclidean algorithm, unique factorization. Prerequisite: Permission of the Department.

Mathematics 70.518W1 (MAT5147)

### **Homological Algebra and Category Theory**

Axioms of set theory, categories, functors, natural transformations; free, projective, injective and flat modules; tensor products and homology functors, derived functors; dimension theory. Also offered, with different requirements, as Mathematics 70.418 for which additional credit is precluded.

Prerequisite: Mathematics 70.310 or permission of the Department.

Mathematics 70.519W1 (MAT5142)

### **Algebra II**

Field theory, algebraic and transcendental extensions, finite fields, Galois groups. Modules over principal ideal domains, decomposition of a linear transformation, Jordan normal form. Prerequisites: Mathematics 70.517 (MAT5141) and permission of the Department.

Mathematics 70.521W1 (MAT5150)

### **Topics in Geometry**

Various axiom systems of geometry. Detailed examinations of at least one modern approach to foundations, with emphasis upon the connections with group theory.

Prerequisite: Permission of the Department.

Mathematics 70.522F1 (MAT5168)

### Homology Theory

The Eilenberg-Steenrod axioms and their consequences, singular homology theory, applications to topology and algebra.

Prerequisite: Mathematics 70.425 ★.

Mathematics 70.525F1 (MAT5151)

### Topology I

Topological spaces, product and identification topologies, countability and separation axioms, compactness, connectedness, homotopy, fundamental group, net and filter convergence. Also offered, with different requirements, as Mathematics 70.425 ★ for which additional credit is precluded.

Prerequisite: Mathematics 70.301 ★ or permission of the Department.

Mathematics 70.526W1 (MAT5152)

### Topology II

Covering spaces, homology via the Eilenberg-Steenrod Axioms, applications, construction of a homology functor. Also offered, with different requirements, as Mathematics 70.426 ★ for which additional credit is precluded.

Prerequisites: Mathematics 70.310 (MAT3143) and 70.525 (MAT5151) or permission of the Department.

Mathematics 70.527F1 (MAT5169)

### Foundations of Geometry

A study of at least one modern axiom system of Euclidean and non-Euclidean geometry, embedding of hyperbolic and Euclidean geometries in the projective plane, groups of motions, models of non-Euclidean geometry.

Prerequisite: Mathematics 70.310 (may be taken concurrently) or permission of the Department.

Mathematics 70.528F1 (MAT5155)

### Differentiable Manifolds

A study of differentiable manifolds from the point of view of either differential topology or differential geometry. Topics such as smooth mappings, transversality, intersection theory, vector fields on manifolds, Gaussian curvature, Riemannian manifolds, differential forms, tensors, and connections are included.

Prerequisite: Mathematics 70.301 ★ or permission of the Department.

Mathematics 70.531F1 (MAT5161)

### Mathematical Logic

A basic graduate course in mathematical logic. Propositional and predicate logic, proof theory, Gentzen's Cut-Elimination, completeness, compactness, Henkin models, model theory, arithmetic and undecidability. Special topics time permitting) depending on interests of instructor and audience.

Prerequisites: Honours undergraduate algebra, analysis and topology or permission of the instructor.

Mathematics 70.535F1 (MAT5163)

### Analytic Number Theory

Dirichlet series, characters, Zeta-functions, prime number theorem, Dirichlet's theorem on primes in arithmetic progressions, binary quadratic forms. Also offered at the undergraduate level, with different requirements, as Mathematics 70.435 ★, for which additional credit is precluded.

Prerequisite: Mathematics 70.307 ★ or permission of the Department.

Mathematics 70.536W1 (MAT5164)

### Algebraic Number Theory

Algebraic number fields, bases, algebraic integers, integral bases, arithmetic in algebraic number fields, ideal theory, class number. Also offered, with different requirements, as Mathematics 70.436 ★ for which additional credit is precluded.

Prerequisite: Mathematics 70.310 or permission of the Department.

Mathematics 70.543 (MAT5187)

### Topics in Applied Mathematics

Mathematics 70.545F1 (MAT5131)

### Ordinary Differential Equations

Existence and uniqueness theorems, boundary value problems, qualitative theory.

Prerequisite: Mathematics 70.308 ★ or permission of the Department.

Mathematics 70.546F1 (MAT5133)

### Introduction to Partial Differential Equations

First order linear, quasi-linear, and nonlinear equations; second order equations in two or more variables; systems of equations; the wave equation; Laplace and Poisson equations; Dirichlet and Neumann problems; Green's functions. Also offered, with different requirements, as Mathematics 70.470 ★ for which additional credit is precluded.

Prerequisites: Mathematics 70.302 ★, or 70.307 ★ and 70.308 ★, or permission of the Department.

Mathematics 70.547W1 (MAT5134)

### Topics in Partial Differential Equations

Theory of distributions, initial-value problems based on two-dimensional wave equations, Laplace transform, Fourier integral transform, diffusion problems, Helmholtz equation with application to boundary and initial-value problems in cylindrical and spherical coordinates. Also offered, with different requirements, as Mathematics 70.471 ★ for which additional credit is precluded.

Prerequisite: Mathematics 70.546 or permission of the Department.

Mathematics 70.550F1 (MAT5177)

### Multivariate Normal Theory

Multivariate normal distribution properties, characterization, estimation of means, and covariance matrix. Regression approach to dis-

tribution theory of statistics; multivariate tests; correlations; classification of observations; Wilks' criteria.

Prerequisite: Mathematics 70.350.

Mathematics 70.551W1 (MAT5191)

### **Mathematical Statistics II**

Confidence intervals and pivotals; Bayesian intervals; optimal tests and Neyman-Pearson theory; likelihood ratio and score tests; significance tests; goodness-of-fit-tests; large sample theory and applications to maximum likelihood and robust estimation. Also offered, with different requirements, as Mathematics 70.457 for which additional credit is precluded.

Prerequisite: Mathematics 70.450★ or 70.560 or permission of the Department.

Mathematics 70.552W1 (MAT5192)

### **Sampling Theory and Methods**

Unequal probability sampling with and without replacement; unified theory for standard errors; prediction approach; ratio and regression estimation; stratification and optimal designs; multistage cluster sampling; double sampling; domains of study; post-stratification; nonresponse; measurement errors; related topics.

Prerequisite: Mathematics 70.452★ or permission of the Department.

Mathematics 70.553F1 (MAT5193)

### **Linear Models**

Theory of non full rank linear models; estimable functions, best linear unbiased estimators, hypotheses testing, confidence regions; multi-way classifications; analysis of covariance; variance component models; maximum likelihood estimation, Minque, Anova methods; miscellaneous topics.

Prerequisite: Mathematics 70.450★ or 70.560 or permission of the Department.

Mathematics 70.554F1 (MAT5194)

### **Stochastic Processes and Time Series Analysis**

Stationary stochastic processes, inference for stochastic processes, applications to time series and spatial series analysis.

Prerequisite: Mathematics 70.451★ or permission of the Department.

Mathematics 70.555W1 (MAT5195)

### **Design of Experiments**

Overview of linear model theory; orthogonality; randomized block and split plot designs; latin square designs; randomization theory; incomplete block designs; factorial experiments: confounding and fractional replication; response surface methodology. Miscellaneous topics.

Prerequisite: Mathematics 70.355★ or 70.450★ or 70.560 or permission of the Department.

Mathematics 70.556W1 (MAT5175)

### **Robust Statistical Inference**

Nonparametric tests for location, scale, and regression parameters; derivation of rank tests; distribution theory of linear rank statistics and their efficiency. Robust estimation of location, scale and regression parameters; Huber's M-estimators, Rank-methods, L-estimators. Influence function. Adaptive procedures. Also offered, with different requirements, as Mathematics 70.456★ for which additional credit is precluded.

Prerequisite: Mathematics 70.450★ or 70.560 or permission of the Department.

Mathematics 70.557W1 (MAT5176)

### **Advanced Statistical Inference**

Pure significance test; uniformly most powerful unbiased and invariant tests; asymptotic comparison of tests; confidence intervals; large-sample theory of likelihood ratio and chi-square tests; likelihood inference; Bayesian inference; fiducial and structural methods; resampling methods.

Prerequisite: Mathematics 70.457★ or 70.551 or permission of the Department.

Mathematics 70.558F1 (MAT5172)

### **Topics in Stochastic Processes**

Course contents will vary, but will include topics drawn from Markov processes. Brownian motion, stochastic differential equations, martingales, Markov random fields, random measures, and infinite particle systems, advanced topics in modelling, population models, etc.

Prerequisites: Mathematics 70.356★ or 70.451★, or permission of the Department.

Mathematics 70.559F1 (MAT5196)

### **Multivariate Analysis**

Multivariate methods of data analysis, including principal components, cluster analysis, factor analysis, canonical correlation, MANOVA, profile analysis, discriminant analysis, path analysis. Also offered at the undergraduate level, with different requirements, as Mathematics 70.453★, for which additional credit is precluded.

Prerequisite: Mathematics 70.450★ or 70.560 or permission of the Department.

Mathematics 70.560F1 (MAT5190)

### **Mathematical Statistics I**

Statistical decision theory; likelihood functions; sufficiency; factorization theorem; exponential families; UMVU estimators; Fisher's information; Cramer-Rao lower bound; maximum likelihood, moment estimation; invariant and robust point estimation; asymptotic properties; Bayesian point estimation. Also offered, with different requirements, as Mathematics 70.450★ for which additional credit is precluded.

Prerequisite: Mathematics 70.350 or permission of the Department.

Mathematics 70.561F1 (MAT5197)

### **Stochastic Optimization**

Topics chosen from stochastic dynamic programming, Markov decision processes, search theory, optimal stopping. Also offered at the undergraduate level, with different requirements, as Mathematics 70.459★, for which additional credit is precluded.

Prerequisite: Mathematics 70.356★ or permission of the Department.

Mathematics 70.562F1 (MAT5317)

### **Analysis of Categorical Data**

Analysis of one-way and two-way tables of nominal data; multi-dimensional contingency tables, log-linear models; tests of symmetry, marginal homogeneity in square tables; incomplete tables; tables with ordered categories; fixed margins, logistic models with binary response; measures of association and agreement; applications biological

Prerequisites: Mathematics 70.450★ or 70.560, 70.457★ or 70.551, or permission of the Department.

Mathematics 70.563W1 (MAT5318)

### **Reliability and Survival Analysis**

Types of censored data; nonparametric estimation of survival function; graphical procedures for model identification; parametric models and maximum likelihood estimation; exponential and Weibull regression models; nonparametric hazard function models and associate statistical inference; rank tests with censored data applications.

Prerequisites: Mathematics 70.450★ or 70.560, 70.457★ or 70.551 or permission of the Department.

Mathematics 70.564F1 (MAT5173)

### **Stochastic Analysis**

Brownian motion, continuous martingales, and stochastic integration.

Prerequisites: Mathematics 70.451★ or 70.578 or permission of the Department

Mathematics 70.565F1 (MAT5165)

### **Theory of Automata**

Algebraic structure of sequential machines, decomposition of machines; finite automata, formal languages; complexity. Also offered, with different requirements, as Mathematics 70.485★/Computer Science 95.485★ for which additional credit is precluded.

Prerequisite: Mathematics 70.210 or permission of the Department.

Mathematics 70.567F1 (MAT5324)

### **Game Theory**

Two-person zero-sum games; infinite games; multi-stage games; differential games; utility theory; two-person general-sum games; bargaining problem; n-person games; games with a continuum of players. Also offered, with different requirements, as Mathematics 70.487★ for which additional credit is precluded.

Prerequisite: Mathematics 70.301★ or permission of the Department.

Mathematics 70.569F1 (MAT5301)

### **Topics in Combinatorial Mathematics**

Prerequisite: Permission of the Department.

Mathematics 70.571W1 (MAT5198)

### **Stochastic Models**

Markov systems, stochastic networks, queueing networks, spatial processes, approximation methods in stochastic processes and queueing theory. Applications to the modeling and analysis of computer-communications systems and other distributed networks. Also offered, with different requirements, as Mathematics 70.458★ for which additional credit is precluded.

Prerequisite: Mathematics 70.356★ or permission of the Department

Mathematics 70.578F1 (MAT5170)

### **Probability Theory I**

Probability spaces, random variables, expected values as integrals, joint distributions, independence and product measures, cumulative distribution functions and extensions of probability measures, Borel-Cantelli lemmas, convergence concepts, independent identically distributed sequences of random variables.

Prerequisites: Mathematics 70.301★, 70.302★, and 70.350, or permission of the Department.

Mathematics 70.579W1 (MAT5171)

### **Probability Theory II**

Laws of large numbers, characteristic functions, central limit theorem, conditional probabilities and expectations, basic properties and convergence theorems for martingales, introduction to Brownian motion.

Prerequisite: Mathematics 70.578 (MAT5170) or permission of the Department.

Mathematics 70.581F1 (MAT5303)

### **Linear Optimization**

Linear programming problems; simplex method, upper bounded variables, free variables; duality; postoptimality analysis; linear programs having special structures; integer programming problems; unimodularity; knapsack problem.

Prerequisite: Course in linear algebra and permission of the Department.

Mathematics 70.582F1 (MAT5325)

### **Introduction to Information and Systems Science**

Introduction to the process of applying computers in problem-solving. Emphasis on the design and analysis of efficient computer algorithms for large, complex problems. Applications: data manipulation, databases, computer networks, queueing systems, optimization. (Also listed as Engineering 94.582, Computer Science 95.582, Information and Systems Science 93.582)

Mathematics 70.583W1 (MAT5304)

### **Nonlinear Optimization**

Methods for unconstrained and constrained optimization problems; Kuhn-Tucker conditions; penalty functions; duality; quadratic programming; geometric programming; separable programming; integer nonlinear programming; pseudo-Boolean programming; dynamic programming.

Prerequisite: Permission of the Department.

Mathematics 70.584F1, W1, S1 (MAT5307)

### **Topics in Operations Research**

Mathematics 70.585F1, W1, S1 (MAT5308)

### **Topics in Algorithm Design**

Mathematics 70.586F1 (MAT5180)

### **Numerical Analysis**

Error analysis for fixed and floating point arithmetic; systems of linear equations; eigen-value problems; sparse matrices; interpolation and approximation, including Fourier approximation; numerical solution of ordinary and partial differential equations.

Prerequisite: Permission of the Department.

Mathematics 70/95.587F1 (MAT5167)

### **Formal Language and Syntax Analysis**

Computability, unsolvable and NP-hard problems. Formal languages, classes of language automata. Principles of compiler design, syntax analysis, parsing (top-down, bottom-up), ambiguity, operator precedence, automatic construction of efficient parsers, LR, LR(O), LR(k), SLR, LL(k). Syntax directed translation. Prerequisites: Mathematics 70.565 or 70.485★ or Computer Science 95.302★, or permission of the Department.

Mathematics 70.588W1 (MAT5305)

### **Combinatorial Optimization I**

Network flow theory and related material. Topics will include shortest paths, minimum spanning trees, maximum flows, minimum cost flows. Optimal matching in bipartite graphs.

Prerequisite: Permission of the Department.

Mathematics 70.589W1 (MAT5306)

### **Combinatorial Optimization II**

Topics include optimal matching in non-bipartite graphs, Euler tours and the Chinese Postman problem. Other extensions of network flows: dynamic flows, multicommodity flows, and flows with gains, Bottleneck problems. Matroid optimization. Enumerative and heuristic algorithms for the Travelling Salesman and other "hard" problems.

Prerequisite: Mathematics 70.588.

Mathematics 70.590F1, W1, S1 (MAT5990)

### **Seminar**

Mathematics 70.591F1, W1, S1 (MAT5991)

### **Directed Studies**

Mathematics 70.592 (MAT5992)

### **Seminar in Biostatistics**

Students work in teams on the analysis of experimental data or experimental plans. The participation of experimenters in these teams is encouraged. Student teams present their results in the seminar, and prepare a brief written report on their work.

Mathematics 70.593F1, W1, S1

### **Project**

Intended for students registered in Information and Systems Science and M.C.S. programs. Students pursuing the non-thesis option will conduct a study, analysis, and/or design project. Results will be given in the form of a typewritten report and oral presentation.

Mathematics 70.594F1, W1, S1

### **Statistical Internship**

This project-oriented course allows students to undertake statistical research and data analysis projects as a cooperative project with governmental or industrial sponsors. Practical data analysis and consulting skills will be emphasized. The grade will be based upon oral and written presentation of results.

Prerequisite: Permission of the Institute.

Mathematics 70/94/95.595F4, W4, S4

### **M.C.S. Thesis**

Mathematics 70.596 (MAT 5993)

### **Research Internship**

This course affords students the opportunity to undertake research in mathematics as a cooperative project with governmental or industrial sponsors. The grade will be based upon the mathematical content as well as upon oral and written presentation of results.

Prerequisite: Permission of the Institute.

Mathematics 70/93/94/95.598 F3, W3, S3

### **M.Sc. Thesis in Information and Systems Science**

Mathematics 70.599F3, W3, S3

### **M.Sc. Thesis**

Mathematics 70.602W1 (MAT5309)

### **Harmonic Analysis on Groups**

Transformation groups; Haar measure; unitary representations of locally compact groups; completeness and compact groups; character theory; decomposition.

Mathematics 70.608F1, W1, S1 (MAT5326)

### **Topics in Analysis**

Mathematics 70.609F1, W1, S1 (MAT5329)

### **Topics in Analysis**

Mathematics 70.611F1, W1, S1 (MAT5327)

### **Topics in Algebra**

Mathematics 70.612F1, W1, S1 (MAT5330)

### **Topics in Algebra**

Mathematics 70.613F1, W1, S1 (MAT5331)

**Topics in Algebra**

Mathematics 70.614W1 (MAT5158)

**Lie Groups**

Matrix groups: one-parameter groups, exponential map, Campbell-Hausdorff formula, Lie algebra of a matrix group, integration on matrix groups. Abstract Lie groups.

Prerequisites: Mathematics 70.507 and 50.517 or permission of the Department.

Mathematics 70.621F1, W1, S1 (MAT5312)

**Topics in Topology**

Mathematics 70.657F1, W1, S1 (MAT5313)

**Topics in Probability and Statistics**

Mathematics 70.658F1, W1, S1 (MAT5314)

**Topics in Probability and Statistics**

Mathematics 70.686F1, W1, S1 (MAT5361)

**Topics in Mathematical Logic**

Mathematics 70.687F1 (MAT5162)

**Mathematical Foundations of Computer Science**

Foundations of functional languages, lambda calculi (typed, polymorphically typed, untyped), Curry-Howard Isomorphism, proofs-as-programs, normalization and rewriting theory, operational semantics, type assignment, introduction to denotational semantics of programs, fixed-point programming.

Prerequisites: Honours undergraduate algebra and either topology or analysis, permission of the instructor or some acquaintance with logic.

Mathematics 70.690F1, W1, S1 (MAT6990)

**Seminar**

Mathematics 70.691F1, W1, S1 (MAT6991)

**Directed Studies**

Mathematics 70.699F, W, S

**Ph.D. Thesis**

# The Ottawa-Carleton Institute for Mechanical and Aerospace Engineering

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University of Ottawa



Carleton University

## The Institute

**Director of the Institute, D. Redekop**

Established in 1984, the Institute combines the research strengths and resources of the Departments of Mechanical and Aerospace Engineering at Carleton University and Mechanical Engineering at the University of Ottawa. Programs leading to master's and Ph.D. degrees are available through the Institute in a range of fields of mechanical and aerospace and materials engineering. Graduate students may pursue their research on either university campus, depending upon the choice of supervisor. Registration will be at the university most appropriate to the student's program of studies and research. Requests for information and applications for admission may be sent to the Director of the Institute.

## Members of the Institute

The "home" department of each member is indicated by (C) for the Department of Mechanical and Aerospace Engineering, Carleton University, and by (O) for the Department of Mechanical Engineering, University of Ottawa.

- F.F. Afagh, *Structural Dynamics and Control, Solid Mechanics, Smart Structures* (C)
- Melek Akben, *Metallurgy, Welding, Hot Working of Metals* (O)
- Andrei Artemev, *Phase Transformations, Solidification Processes* (C)
- J.C. Beddoes, *Physical Metallurgy and Metal Processing* (C)
- Robert Bell, *Finite Element Analysis, Stress Analysis, Solid Mechanics, Fracture Mechanics* (C)
- M.J. Bibby, *Materials and Manufacturing Engineering, Weld Analysis* (C)
- Shui-Chih Cheng, *Heat Transfer, Numerical Methods* (O)
- M.C. de Malherbe, *Design, Manufacturing Engineering Processes* (C-Adjunct)
- Balbir Dhillon, *Reliability* (O)
- Atef Fahim, *CAD/CAM, Controls* (O)

- J.E.D. Gauthier, *Gas Turbine Technologies, Combustion* (C)
- J.A. Gaydos, *Thermodynamics, Continuum Mechanics* (C)
- K.R. Goheen, *Controls, CAD/CAM/CIM* (C-Adjunct)
- J.A. Goldak, Professor Emeritus, *Computer-Integrated Manufacturing Processes, Finite Element Modelling of Manufacturing* (C-Adjunct)
- D.J. Gorman, Professor Emeritus, *Vibrations*, (O)
- D.C. Groeneveld, *Heat Transfer, Two Phase Flow* (O-Adjunct)
- Yehia Haddad, *Applied Mechanics, Materials and Design* (O)
- W.L.H. Hallett, *Combustion* (O)
- F. Hamdullahpur, *Fluidized Beds, Hydrodynamics, Cyclone Modeling* (C)
- E.S. Hanff, *Unsteady Aerodynamics, Unsteady Wind Tunnel Techniques* (C-Adjunct)
- C.H. Hersom, *Spacecraft Design Instrumentation* (C-Adjunct)
- B. Jodoin, *Thermofluids, Plasma Physics* (O)
- R.J. Kind, *Aerodynamics of Aircraft and Turbomachinery* (C)
- A.S. Krausz, Professor Emeritus, *Fracture, Plasticity, Manufacturing*, (O)
- M. Lamontagne, *Biomechanics and Biomedical Engineers* (O, cross-appointed from School of Human Kinetics)
- R. Langlois, *Flexible Multibody Dynamics; Vehicle Dynamics, Aircraft/Ship Dynamic Interface Analysis, Mathematical Modeling and Simulation* (C)
- B.H.K. Lee, *Aerodynamics, Aeroelasticity* (O-Adjunct)
- Yung Lee, Professor Emeritus, *Heat Transfer, Nuclear Engineering* (O)
- Ming Liang, *Production and Manufacturing Systems* (O)
- R. Liu, *Fracture Mechanics, Fatigue, Crack Behaviour, Closure, Composite Materials, Numerical Methods, Finite Element Analysis* (C)
- L.C. Mallory, *Materials, Welding* (O)
- J.M. McDill, *Adaptive Thermal-microstructural Mechanical Finite Element Analysis for Manufacturing Processes* (C)

- N.B. McLaughlin, *Tractive Performance of Four-Wheel Drive Tractors* (C-Adjunct)
- R.E. Milane, *Combustion, Fluid Mechanics* (O)
- R. Miller, *Computational Materials Science, Multi-Scale Modeling of Materials, Atomistic Modeling of Crystalline Defects* (C)
- Shaikat Mirza, Professor Emeritus, *Vibrations, Stress Analysis* (O)
- Hany Moustapha, *Turbomachinery, Aerodynamics* (C-Adjunct)
- M.B. Munro, *Composite Materials* (O)
- Tofy Mussivand, *Medical Devices Design, Evaluation (in vitro, in vivo, clinical), Artificial Heart Sensors, Valves and Prosthetics* (C-Adjunct)
- D.S. Neculescu, *Control, Robotics, Reliability* (O)
- F. Nitzsche, *Aeroelasticity, Control, Helicopter Noise, Smart Structures* (C)
- A.K. Pilkey, *Physical Metallurgy, Failure Mechanisms, Quantitative Metallography* (C-Adjunct)
- E.G. Plett, *Energy Systems, Fluid Mechanics, Thermodynamics and Heat Transfer, Numerical Modelling* (C)
- David Redekop, *Applied Mechanics, Finite Element Analysis, Robotics* (O)
- W.G. Richarz, *Aeronautical Engineering, Acoustics, Instrumentation* (C-Adjunct)
- J.T. Rogers, Professor Emeritus, *Heat Transfer, Energy Systems, Nuclear Engineering* (C-Adjunct)
- D.L. Russell, *Dynamics, Controls, Medical Device Design* (C)
- H.I.H. Saravanamuttoo, Professor Emeritus, *Gas Turbine Performance, Engine Health Monitoring* (C)
- J.Z. Sasiadek, *Robotics and Automation, Guidance, Navigation and Computer Control Systems* (C)
- R.K. Singhal, *Structural Dynamics, Vibration Analysis and Testing* (O-Adjunct)
- J.S. Sinkiewicz, *Robotics, Guidance, Navigation, Space* (C-Adjunct)
- S.A. Sjolander, *Aerodynamics, Turbomachinery, Wind-Tunnel Engineering* (C)
- D.A. Staley, *Spacecraft Dynamics and Control* (C)
- P.V. Straznicky, *Design, Light Weight Structures* (C)
- C.L. Tan, *Solid Mechanics, Fracture Mechanics, Boundary Integral and Finite Element Methods* (C)
- Stavros Tavoularis, *Fluid Mechanics, Experimental Techniques* (O)
- G. Tyc, *Spacecraft Dynamics and Control* (C-Adjunct)
- Frank Vigneron, *Space Dynamics* (C-Adjunct)
- George Vukovich, *Control Systems* (C-Adjunct)
- W. Wallace, *Materials Engineering* (C-Adjunct)
- X. Wang, *Fracture Mechanics, Fatigue and Fracture, Finite Element Applications, Pressure Vessel and Piping* (C)
- J.Y. Wong, Professor Emeritus, *Vehicle Engineering, Transportation Technology* (C-Adjunct)
- M.J. Worswick, *Solid Mechanics, High Strain Rate, Metal Forming* (C-Adjunct)
- M.I. Yaras, *Turbomachinery, Aerodynamics, Computational Fluid Dynamics* (C)
- J.S. Zhang, *Material Emission Characteristics, Indoor Air Quality Modelling* (C-Adjunct)

## Master's Degree

### Admission Requirements

The normal requirement for admission to the master's program is a bachelor's degree with at least high honours standing in mechanical or aerospace engineering or a related discipline.

### Program Requirements

The requirements for course work are specified in terms of credits: one credit is one hour/week for one term (thirteen weeks). The requirements for the master's degree by thesis are:

- \* Eighteen course credits
- \* Participation in the Mechanical and Aerospace Engineering seminar series
- \* Thesis

The requirements for the master's degree by course work are: twenty-seven course credits plus a project equivalent to nine course credits (Engineering 88.598 for Carleton University students; MCG6000 for University of Ottawa students).

### Guidelines for Completion of Master's Degree

Students are expected to complete the master's program within the maximum limits outlined in the Section 13.2 of the General Regulations section of this Calendar (see p.65.)

## Doctor of Philosophy

### Admission Requirements

The normal requirement for admission to the Ph.D. program is a master's degree in mechanical or aerospace engineering or a related discipline. Students who have been admitted to the master's program may be permitted to transfer into the Ph.D. program if they show outstanding academic performance and demonstrate significant promise for advanced research.

In addition, graduate courses offered by departments in other disciplines may be taken for credit with approval by the department in which the student is registered.

### Program Requirements

The requirements for the Ph.D. degree (from the master's degree) are:

- \* Nine course credits
- \* Participation in the Mechanical and Aerospace Engineering seminar series
- \* Successful completion of qualifying examinations
- \* Thesis. The examining board for all theses will include professors from both departments and an external examiner who is a member of neither university.

Students who have been permitted to transfer into the Ph.D. program from a master's program require twenty-seven course credits for the Ph.D.

### Guidelines for Completion of Doctoral Degree

Students are expected to complete the doctoral program within the maximum time limits outlined in section 13.3 of the General Regulations section of this Calendar. In addition, Ph.D. candidates are required to complete Parts I, II, and III of the Ph.D. comprehensive examinations according to the timing outlined in the Ph.D. comprehensive guidelines which are distributed by the department involved.

### Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

In all programs, the student may choose graduate courses from either university with the approval of the adviser or the advisory committee. The available graduate courses are listed

below, grouped by subject area. Course descriptions are to be found in the departmental section of the calendar concerned. All courses are of one term duration. The following codes identify the department offering the course: "88" Department of Mechanical and Aerospace Engineering, Carleton University, "89" Department of Mechanical Engineering, University of Ottawa

#### *Thermofluids*

88.500 (MCG5300) 88.501 (MCG5301)  
88.503 (MCG5303) 88.504 (MCG5304)  
88.508 (MCG5308) 88.509 (MCG5309)  
88.521 (MCG5321) 88.530 (MCG5330)  
88.531 (MCG5331) 88.532 (MCG5332)  
88.534 (MCG5334) 88.543 (MCG5343)  
88.547 (MCG5347) 88.548 (MCG5348)  
88.586 (MCG5386) 89.511 (MCG5111)  
89.531 (MCG5131) 89.532 (MCG5132)  
89.533 (MCG5133) 89.534 (MCG5134)  
89.536 (MCG5136) 89.541 (MCG5141)  
89.548 (MCG5551) 89.549 (MCG5552)  
89.550 (MCG5557) 89.551 (MCG5151)  
89.552 (MCG5152) 89.555 (MCG5155)  
89.556 (MCG5156) 89.557 (MCG5157)  
89.558 (MCG5158) 89.561 (MCG5161)  
89.591 (MCG5191) 89.592 (MCG5192)

#### *Solid Mechanics and Materials*

88.517 (MCG5317) 88.550 (MCG5350)  
88.555 (MCG5355) 88.561 (MCG5361)  
88.562 (MCG5362) 88.563 (MCG5381)  
88.565 (MCG5365) 88.566 (MCG5366)  
88.567 (MCG5367) 88.568 (MCG5368)  
88.580 (MCG5480I) 88.582 (MCG5483I)  
88.583 (MCG5488I) 88.585 (MCG5482I)  
89.501 (MCG5101) 89.502 (MCG5102)  
89.503 (MCG5103) 89.504 (MCG5104)  
89.505 (MCG5105) 89.506 (MCG5106)  
89.507 (MCG5107) 89.508 (MCG5108)  
89.509 (MCG5109) 89.510 (MCG5110)  
89.514 (MCG5114) 89.515 (MCG5115)  
89.517 (MCG5117) 89.518 (MCG5118)  
89.519 (MCG5119) 89.526 (MCG5126)  
89.529 (MCG5129) 89.537 (MCG5137)  
89.580 (MCG5180) 89.581 (MCG5181)  
89.582 (MCG5182) 89.586 (MCG5186)

#### *Design and Manufacturing*

88.552 (MCG5352) 88.553 (MCG5353)  
88.561 (MCG5361) 88.562 (MCG5362)  
88.564 (MCG5364) 88.574 (MCG5374)  
88.575 (MCG5375) 88.581 (MCG5489I)  
89.515 (MCG5115) 89.559 (MCG5159)  
89.568 (MCG5168) 89.569 (MCG5169)  
89.570 (MCG5170) 89.571 (MCG5171)  
89.572 (MCG5172) 89.573 (MCG5173)  
89.576 (MCG5176) 89.577 (MCG5177)  
89.578 (MCG5178) 89.579 (MCG5179)  
89.585 (MCG5185)

*Transportation Technology*

88.510 (MCG5310) 88.511 (MCG5311)  
88.514 (MCG5314) 88.515 (MCG5315)  
88.521 (MCG5321) 88.530 (MCG5330)  
88.531 (MCG5331) 88.541 (MCG5341)  
88.542 (MCG5342) 88.554 (MCG5354)  
88.556 (MCG5356) 89.538 (MCG5138)  
88.596 (MCG5395) 88.598 (MCG5398)  
89.500 (MCG6000)

# Mechanical and Aerospace Engineering

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 Fax: 520-5715  
 Email: maeinfo@mae.carleton.ca  
 Website: www.mae.carleton.ca

## The Department

**Chair of the Department, Robert Bell**

**Associate Chair (Graduate Studies), E.G. Plett**

**In addition to University and Graduate Faculty regulations, all Engineering departments share common procedures that are described in Section 18 of the General Regulations (see p.69).**

The Department of Mechanical and Aerospace Engineering offers programs of study and research leading to M.Eng. degrees in Aerospace Engineering, Materials Engineering, and Mechanical Engineering, and to Ph.D. degrees in Aerospace and Mechanical Engineering. These degrees are offered through the Ottawa-Carleton Institute for Mechanical and Aerospace Engineering, which is jointly administered by the Department of Mechanical and Aerospace Engineering at Carleton University, and the Department of Mechanical Engineering at the University of Ottawa. For further information, including admission and program requirements, see p.247.

Programs of research and study are offered in several areas:

- \* Aerodynamics and Gas Dynamics
- \* Heat Transfer
- \* Stress and Failure Analysis
- \* Lightweight Structures and Aeroelasticity
- \* Vibration Analysis
- \* Computer-Aided Design and Engineering
- \* Robotics
- \* Control Systems
- \* Vehicle (Performance and Safety)
- \* Engineering
- \* Nuclear Engineering
- \* Energy Systems
- \* Energy Conversion and Utilization
- \* Manufacturing Engineering
- \* Materials Engineering

The Department has a major research commitment, both analytical and experimental, to thermofluid-dynamic and mechanical problems of gas turbine engine design and operation. Current work includes flow prediction and analysis in turbo-machines; two- and three-dimensional boundary layer behaviour; tip-leakage effects and other losses; dynamics of gas turbine power plants; design and performance of highly loaded turbines; engine noise; stress, deformation, and vibration of compressor and turbine blades and discs; finite element analysis; dynamics of high-speed rotors and failure modes of materials in extreme environments.

Another area of intense research effort in the Department is computer-aided engineering. Activities in this field include computer-aided analysis (including computational fluid dynamics as well as the finite and boundary element methods), computer-aided design, and computer-integrated manufacturing. Projects include thermal and mechanical analysis of welding and casting processes, heat and fluid flow analyses, stress, deformation (manufacturing processes), vibration and fracture mechanics studies, and solids modelling. Computer-aided engineering is well supported by computer hardware and software, including a state-of-the-art network of engineering workstations. The Department has a substantial involvement in the Manufacturing Research Centre of Ontario.

As part of the faculty interest in transportation, the Department is active in research on air and ground vehicle technology. Current studies include computational methods for steady and unsteady flows over complex configurations; effects of roughness on aerodynamic performance; aircraft noise; boundary layer separation and control; propeller and rotor aerodynamics and noise. The Transport Technology Research Laboratory has been organized for ground transport studies; design and optimization of off-road vehicles; vehicle safety; anti-lock braking systems; vehicle-terrain interaction; effect of vibration on vehicle performance; dynamics of air-cushion and magnetically levitated vehicles and composite and structural elements.

Members of the Department are engaged in research on various aspects of energy conversion, storage, and utilization. In addition to the previously mentioned work on gas turbines, research is being undertaken on nuclear energy, effectiveness of energy end-use, and behaviour in wind of energy-conserving cladding systems for buildings. In the nuclear energy field, research is being undertaken in heat transfer and fluid flow aspects of CANDU and SLOWPOKE reactors, with a major effort on thermohydraulic problems in reactor safety. Work is also in progress on reactor safety in general, with a special emphasis on risk. Research activities in this field also include studies on the utilization of CANDU reactors for

thermal energy supply as well as electrical generation, and on applications of up-rated SLOWPOKE reactors to low-temperature industrial heating and to building energy needs. Research is being carried out into the structural integrity of CANDU reactor components in the form of evaluations of non-destructive testing methods suitable for zirconium alloy specimens.

Another area of interest is in design, manufacturing, and materials technology; in particular, there are programs on the properties of welded joints, heat treatment and forming studies.

The departmental laboratories are well equipped for the various research activities described above, and these are supported by a machine shop, electronics shop, and extensive computing facilities mentioned earlier.

The extensive laboratory facilities of the National Research Council, and of the Department of Resources Canada are also used, by special arrangement, for research and graduate studies of mutual interest. Strong contacts are maintained with the gas turbine, aircraft, and nuclear power industries.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Engineering 88.500F1 (MCG5300)

### Fundamentals of Fluid Dynamics

Differential equations of motion. Viscous and inviscid regions. Potential flow: superposition; thin airfoils; finite wings; compressibility corrections. Viscous flow: thin shear layer approximation; laminar layers; transition; turbulence modelling. Convective heat transfer: free versus forced convection; energy and energy integral equations; turbulent diffusion. Also offered at the undergraduate level, with different requirements, as Engineering 87.432★, for which additional credit is precluded.

Engineering 88.501W1 (MCG5301)

### Theory of Viscous Flows

Navier-Stokes and boundary layer equations; mean flow equations for turbulent kinetic energy; integral formulations. Stability, transition, turbulence, Reynolds stresses; separation. Calculation methods, closure schemes. Compressibility, heat transfer, and three-dimensional effects.

Engineering 88.503F1 (MCG5303)

### Incompressible Non-Viscous Flow

The fundamental equations and theorems for non-viscous fluid flow; solution of two-dimensional and axisymmetric potential flows; low-speed airfoil and cascade theory; wing lifting-line theory; panel methods.

Engineering 88.504F1 (MCG5304)

### Compressible Non-Viscous Flow

Steady isentropic, frictional, and diabatic flow; shock waves; irrotational compressible flow; small perturbation theory and similarity rules; second-order theory and unsteady, one-dimensional flow.

Engineering 88.508W1 (MCG5308)

### Experimental Methods in Fluid Mechanics

Fundamentals of techniques of simulation of fluid dynamic phenomena. Theoretical basis, principles of design, performance and instrumentation of ground test facilities. Applications to aerodynamic testing.

Engineering 88.509W1 (MCG5309)

### Environmental Fluid Mechanics Relating to Energy Utilization

Characteristics of energy sources and emissions into the environment. The atmosphere; stratification and stability, equations of motion, simple winds, mean flow, turbulence structure and dispersion near the ground. Flow and dispersion in groundwater, rivers, lakes and oceans. Physical and analytical modelling of environmental flows.

Engineering 88.510W1 (MCG5310)

### Performance and Economics of Aircraft

Aircraft performance analysis with emphasis on factors affecting take-off, landing and economic performance; high lift schemes; operating economics.

Engineering 88.511F1 (MCG5311)

### Dynamics and Aerodynamics of Flight

Static stability theory. Euler's equations for rigid body motion; the linearized equations of motion; stability derivatives and their estimation. Longitudinal and lateral dynamic response of an aircraft to control and disturbance. Also offered at the undergraduate level, with different requirements, as Engineering 87.438★, for which additional credit is precluded.

Engineering 88.514F1 (MCG5314)

### Ground Transportation Systems and Vehicles

Performance characteristics, handling and directional stability, ride comfort and safety of various types of ground vehicle systems including road vehicles, terrain-vehicle systems, guided transport systems, and advanced ground transport technology.

Engineering 88.515W (MCG5315)

### Orbital Mechanics and Space Control

Orbital dynamics and perturbations due to the

Earth's figure, the sun, and the moon with emphasis on mission planning and analysis. Rigid body dynamics applied to transfer orbit and on-orbit momentum management and control of spacecraft. Effects of flexible structures on a spacecraft control system.

Engineering 88.517W1 (MCG5317)

#### **Experimental Stress Analysis**

Introduction to theory of elasticity. Photo-elasticity: types of polariscopes, two- and three-dimensional stress fields, frozen patterns. Photoelastic coatings. Strain gauges; gauge factors, sensitivity, calibration, and temperature compensation. Moiré fringes, brittle lacquers, mechanical strain gauges.

Engineering 88.521W1 (MCG5321)

#### **Methods of Energy Conversion**

Technical, economic and environmental aspects of present and proposed large-scale systems of energy conversion.

Engineering 88.530F1 (MCG5330)

#### **Engineering Acoustics**

Review of acoustic waves in compressible fluids; acoustic pressure, intensity and impedance; physical interpretation and measurement; transmission through media; layers, in-homogeneous media, solids; acoustic systems; rooms, ducts, resonators, mufflers, properties of transducers; microphones, loudspeakers, computational acoustics.

Engineering 88.531W1 (MCG5331)

#### **Aeroacoustics**

The convected wave equation; theory of subsonic and supersonic jet noise; propeller and helicopter noise; fan and compressor noise; boundary layer noise, interior noise; propagation in the atmosphere; sonic boom; impact on environment.

Engineering 88.532F1 (MCG5332)

#### **Instrumentation Techniques**

An introduction for the non-specialists to the concepts of digital and analog electronics with emphasis on data acquisition, processing and analysis. Topics covered include operational amplifiers, signal processing, digital logic systems, computer interfacing, noise in electronic systems. Hands-on sessions illustrate theory and practice.

Engineering 88.534W1 (MCG5334)

#### **Computational Fluid Dynamics of Compressible Flows**

Solution techniques for parabolic, elliptic and hyperbolic equations developed for problems of interest to fluid dynamics with appropriate stability considerations. A staged approach to solution of full Euler and Navier-Stokes equations is used. Grid generation techniques appropriate for compressible flows are introduced.

Engineering 88.541F1 (MCG5341)

#### **Turbomachinery**

Types of machines. Similarity: performance parameters; characteristics; cavitation. Velocity triangles. Euler equation: impulse and reaction. Radial pumps and compressors: analysis, design and operation. Axial pumps and compressors: cascade and blade-element methods; staging; off-design performance; stall and surge. Axial turbines. Current design practice. Also offered at the undergraduate level, with different requirements, as Engineering 88.435★, for which additional credit is precluded.

Engineering 88.542W1 (MCG5342)

#### **Gas Turbines**

Interrelationship among thermodynamic, aerodynamic, and mechanical design. Ideal and real cycle calculations. Cycle optimization; turbo-shaft, turbojet, turbofan. Component performance. Off-design performance; matching of compressor, turbine, nozzle. Twin-spool matching.

Engineering 88.543W1 (MCG5343)

#### **Advanced Thermodynamics**

The course covers three major topics: review of fundamentals from a consistent viewpoint, properties and equations of state, and applications and special topics. The third topic includes an introduction to statistical thermodynamics.

Engineering 88.547W1 (MCG5347)

#### **Conductive and Radiative Heat Transfer**

Analytical, numerical and analog solutions to steady-state and transient conduction heat transfer in multi-dimensional systems. Radiative heat exchange between black, grey, non-grey diffusive and specular surfaces, including effects of athermanous media.

Engineering 88.548W1 (MCG5348)

#### **Convective Heat and Mass Transfer**

Analogies between heat, mass and momentum transfer. Forced and free convection relations for laminar and turbulent flows analytically developed where possible and otherwise deduced from experimental results, for simple shapes and in heat exchangers. Mass transfer theory and applications.

Engineering 88.550W1 (MCG5350)

#### **Advanced Vibration Analysis**

General theory of continuous and discrete multi-degree-of-freedom vibrating systems. Emphasis on numerical techniques of solving complex vibrating systems, with selected applications from aerospace, civil, and mechanical engineering.

Engineering 88.552W1 (MCG5352)

#### **Optimal Control Systems**

Review of transfer function and state-space system descriptions. Elements of the optimal control problem. Variational calculus. Optimal

state feedback control. Riccati equations. Optimal observers and Kalman-Bucy Filters. Extension to discrete time systems including an introduction to dynamic programming. Practical applications are emphasized throughout the course.

Engineering 88.553F1 (MCG5353)

### **Robotics**

The history of and introduction to robotics methodology. Robots and manipulators; homogeneous transformation, kinematic equations, solving kinematic equations, differential relationships, motion trajectories, dynamics. Control; feedback control, compliance, servomotors, actuators, external and internal sensors, grippers and vision systems. Microprocessors and their application to robot control. Programming.

Engineering 88.554W1 (MCG5354)

### **Guidance, Navigation and Control**

Guidance system classification, flight control systems, targeting, target tracking, sensing. Modern multivariable control analysis; design requirements, sensitivity, robustness, perturbations, performance analysis. Modern filtering and estimation techniques. Terrestrial navigation; tactical air navigation (TACAN), star trackers. Guidance mission and performance. Aircraft, missile and spacecraft guidance and control.

Engineering 88.555F1 (MCG5355)

### **Stability Theory and Applications**

Fundamental concepts and characteristics of modern stability definitions. Sensitivity and variational equations; linear variational equations; phase space analysis; Lyapunov's direct method. Autonomous and nonautonomous systems; stability in first approximation; the effect of force type on stability; frequency method.

Engineering 88.556W1 (MCG5356)

### **Neuro and Fuzzy Control**

Knowledge-based controllers. Fuzzy control: mathematics, relations, operations, approximate reasoning. Fuzzy knowledge base control and structure. Fuzzification, inference engine, defuzzification. Nonlinear, adaptive fuzzy control systems. Stability, Neuro-control: processing, learning. Adaptation of artificial neural systems: associative memories, algorithms, applications, and network implementation. Neurofuzzy systems: industrial applications.

Engineering 88.561W1 (MCG5361)

### **Creative Problem Solving and Design**

Problem-solving processes and how they can be applied in engineering design. Emphasis on learning methodologies rather than accumulating information. Techniques can be successfully applied in any engineering speciality. (Also listed as Industrial Design 85.531)

Engineering 88.562F1 (MCG5362)

### **Failure Prevention (Fracture Mechanics and Fatigue)**

Design of engineering structures to ensure against failure due to fatigue or brittle fracture. Nature of fatigue and brittle fracture; selection of suitable material, geometry, and inspection procedures for the load and environmental conditions.

Engineering 88.563W1 (MCG5381)

### **Lightweight Structures**

Structural behaviour. Fundamentals of basic elasticity. Energy methods of structural analysis. Bending, shear, and torsion of open and closed multicell structures. Bending of plates. Structural idealization and its effects on open and closed sections. Structural stability.

Engineering 88.564W1 (MCG5364)

### **Computational Metallurgy**

Development of microstructure in alloys on solidification processes and post-solidification processing. Nucleation and growth of solid phase. Formation of a dendrite structure, macro and micro segregations. Pore formation in castings. Thermodynamic and kinetics of phase transformations and structure evolution in solid alloys.

Engineering 88.565F1 (MCG5365)

### **Finite Element Analysis I**

An introduction to the finite element methodology, with emphasis on applications to heat transfer, fluid flow and stress analysis. The basic concepts of Galerkin's method, interpolation, numerical integration, and isoparametric elements are taught using simple examples.

Engineering 88.566W1 (MCG5366)

### **Finite Element Analysis II**

Time marching heat flow problems with linear and nonlinear analysis. Static plasticity. Time-dependent deformation problems; viscoplasticity, viscoelasticity, and dynamic analysis. Isoparametric elements and numerical integration are used throughout.

Engineering 88.567F1 (MCG5367)

### **The Boundary Integral Equation (BIE) Method**

Integral equations. The BIE for potential theory and for elastostatics in two-dimensions. Boundary elements and numerical integration schemes. Practical applications.

Engineering 88.568W1 (MCG5368)

### **Advanced Engineering Materials**

The physical metallurgy of important engineering metals and alloys: analytical techniques, crystallography and structure of alloys, dislocation interactions and dissociation, metallurgical thermodynamics and transformations and strengthening mechanisms. Highlights the physical phenomena controlling the properties. Prerequisite: Engineering 88.270 or the equivalent.

Engineering 88.574W1 (MCG5374)

**Computer-Integrated Manufacturing Systems (CIMS)**

Topics essential to CIMS including computer graphics, geometric modelling, numerically controlled machining, and flexible manufacturing. The fundamental data structures and procedures for computerization of engineering design, analysis and production. Also offered at the undergraduate level, with different requirements, as Engineering 88.474★, for which additional credit is precluded.

Engineering 88.575F1 (MCG5375)

**CAD/CAM**

Computer aided design and manufacturing methodology through hands-on experience and state-of-the-art software. Topics include mathematical representation, solid modelling, drafting, mechanical assembly, mechanism design, and CNC machining. CAD data exchange standards, rapid prototyping, concurrent engineering, and design for X are also discussed. Also offered at the undergraduate level, with different requirements, as Engineering 88.475★, for which additional credit is precluded.

Engineering 88.580 (MCG5480)

**Special Topics in Mechanical and Aerospace Engineering**

Topic for 2001-2002: Application to plasticity, from a solid mechanics viewpoint. Topics include: tensors, indicial notation and tensor manipulation. Continuum descriptions of deformation, strain and stress. Objective tensors. constitutive relations, elasticity and elementary plasticity. Yield surface, flow potential and normality.

Engineering 88.581W1 (MCG5489)

**Special Topics in Mechanical and Aerospace Engineering**

Topic for 2001-2002: Biomechanics. Human anatomy and physiology with an emphasis on artificial organ and prosthetic device design requirements. Application of engineering principles to cells and tissues, biofluid mechanics, human body energetics, measurement techniques, mechanics of the musculoskeletal, circulatory and pulmonary systems. Emphasis on the artificial heart. Also offered at the undergraduate level, with different requirements, as Engineering 86.496A, for which additional credit is precluded.

Engineering 88.582 (MCG5483)

**Special Topics in Mechanical and Aerospace Engineering**

Topic for 2001-2002: Welding Engineering. Welding processes and design. Topics include: welding processes and symbols, metallurgical aspects of welding, heat transfer, design and stress analysis, fracture of welds, non-destructive

testing and welding codes, welding case studies. Also offered at the undergraduate level, with different requirements, as Engineering 88.496C, for which additional credit is precluded.

Engineering 88.583F1 (MCG5488)

**Special Topics in Mechanical and Aerospace Engineering**

Topic for 2001-2002: Tribology. Plasma-assisted physical vapour deposition and ion implantation as surface engineering methods. Properties of thin coatings. Wear resistance parameters; hard films such as TiN and carbon-like diamond. Reduction of friction coefficient-thin solid lubricants. Bulk materials. Friction and wear phenomena characterization. Wear processes.

Engineering 88.585W1 (MCG5482)

**Special Topics in Mechanical and Aerospace Engineering**

Topic for 2001-2002: Advanced Space Studies. Space technology, physics and life sciences related to manned spaceflight. Topics may include spacecraft design, technical requirements for manned spaceflight, shuttle systems, biology, fluid physics in microgravity, remote sensing from space, aeronomy, and the mobile servicing system. Also offered at the undergraduate level, with different requirements, as Engineering 86.496B, for which additional credit is precluded.

Engineering 88.586 (MCG5486)

**Special Topics in Mechanical and Aerospace Engineering**

Topic for 2001-2002: Continuum Thermodynamics. Equilibrium and non-equilibrium thermodynamics as a field theory. Topics include: conditions of equilibrium, Gibbs-Duhem relation, Legendre transforms and their use, Maxwell relations with simple applications, concept of local equilibrium, hydrodynamic equations, phenomenological relations. Applications to both simple and more complex systems. Prerequisite: Undergraduate courses in matrix algebra, calculus of several variables, ordinary differential equations.

Engineering 88.587 (MCG5387)

**Special Topics in Mechanical and Aerospace Engineering**

Topic will vary from year to year.

Engineering 88.596F1, W1, S1 (MCG5395)

**Directed Studies**

Engineering 88.598F3, W3, S3 (MCG5398)

**Independent Engineering Study**

Students pursuing a master's degree by course work carry out an independent study, analysis, and solution of an engineering problem or design project. The results are given in the form of a written report and presented at a departmental seminar. Carried out under the general direction of a faculty member.

Engineering 88.599F4, W4, S4

**M.Eng. Thesis**

Engineering 88.699F, W, S

**Ph.D. Thesis**

**Other Courses of Particular Interest**

*Civil and Environmental Engineering*

82.511, 82.512, 82.513, 82.524, 82.534, 82.562

*Mathematics and Statistics*

70.486 Numerical Analysis

70.586

*Physics*

75.447 Statistical Physics

75.511

*Systems and Computer Engineering*

94.501, 94.504, 94.505, 94.541, 94.542,

94.552, 94.553

# Mechanical Engineering (University of Ottawa)

University of Ottawa  
Room A-205 Colonel By Hall  
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Fax: 562-5177

## The Department

**Chair of the Department,** W.L.H.Hallett

**Graduate Studies Officer,** R. Milane

The Department of Mechanical Engineering is one of the two constituents of the Ottawa-Carleton Institute for Mechanical and Aerospace Engineering. Consult the Institute entry beginning on p. 247 of this Calendar for a faculty list, graduate program descriptions, and admission requirements.

Programs of research and study are offered in several areas. Most research projects in the Department are in the general fields of thermofluids, solid mechanics, materials and design, manufacturing, and industrial engineering. Members of the Department are engaged in research on the following topics: elasticity, plasticity, viscoelasticity, micromechanics of solids, stress analysis of shells, shell dynamics, structural dynamics, strength of materials, vibration, flow-induced vibration, hot working of metals, welding, time and temperature dependent solid state processes, constitutive relations of plasticity and fracture, fibre composite material pressure vessels and high performance energy storage rotors, automated manufacturing of composites, two-phase heat transfer and fluid flow related to nuclear reactors, two-phase thermosyphons, turbulent flow structure, turbulent diffusion, flow and heat transfer in rod bundles, hemodynamics of cardiac assist devices, supersonic aerodynamics, thermal spraying processes, computational fluid dynamics, flow visualization, heat exchangers, power generation, liquid fuel combustion, fuel bed combustion, integrated computer-aided design systems, computer-aided manufacturing and automation, computer control of mechanical systems, robot design and control, computer vision for control of machines, reliability modelling, human reliability, common-cause failures, transit system reliability, and power production system reliability.

## Research Facilities

Research is conducted in large, modern and well-equipped laboratories containing wind tunnels, water tunnels, two-phase heat transfer and fluid flow loops, submerged arc welders, computer controlled filament winder, triaxial composite braider material testing apparatus including computer controlled tensile machine, hydraulic fatigue testing machine and impact tester, metallographic apparatus, instrumented

GTA welding facility, high-speed data acquisition systems, shaker table, a state of the art CAD/CAM facility, robots, computer controllers, computer controlled machine tools, fuel bed combustor, high pressure droplet chamber, supersonic cold spray system.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002 please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

Engineering 89.501 (MCG5101)

### Theory of Elasticity

Analysis of stress and strain. Stress and strain tensors. Yield criteria laws of elasticity and general theorems. Stress functions. Two-dimensional problems in rectangular and polar coordinates. Applications in plates and shells. Strain energy techniques. Application of numerical analysis to elasticity problems.

Engineering 89.502 (MCG5102)

### Advanced Stress Analysis

Solutions to special beam problems including beams on elastic foundations, curved beams, multi-span beams, etc. as well as some axisymmetric problems. The significance of assumptions is discussed and solution techniques including series solutions and energy methods are utilized.

Engineering 89.503 (MCG5103)

### Theory of Perfectly Plastic Solids

Inelastic behaviour, model materials. Yield criteria and flow laws. Energy principles. Contained plastic deformation. Plane strain. Slipline fields. Applications to metal-forming processes.

Engineering 89.504 (MCG5104)

### Theory of Plates and Shells

A general coverage of various approaches to plate problems and the application of these methods to practical cases. A study of the theory of shells including deformation of shells without bending, stresses under various loading conditions, general theory of shells, shells forming surfaces of revolution.

Engineering 89.505 (MCG5105)

### Continuum Mechanics

Fundamental equations of continuum mechanics. Thermodynamics of continua. Rheological equations. Hamilton's principle for continua. Analytical solution of some elasticity and incompressible fluid dynamic problems. Extension to viscoelasticity and plasticity. Sound waves. Shock waves. Numerical methods of solution.

Engineering 89.506 (MCG5106)

**Advanced Topics in Elasticity**

Algebraic computation software. Curved solids. Governing equations of planar elastostatics in Cartesian coordinates. Governing equations of plates. Linear shell theory in curvilinear coordinates. Introduction to non-linear elastostatics. Non-linear shell theory. Instability of cylindrical shells. Thick and thin shell elastodynamics.

Engineering 89.507 (MCG5107)

**Advanced Dynamics with Applications**

Review of Euler/Newton and D'Alembert formulation, Euler Angles, Gyrodynamics, analysis and response of rotating machinery. Lagrangian dynamics, generalized coordinates, virtual work, generalized forces and the power function. System constraint forces and equilibrium. Modelling and formulation of multi-degree of freedom vibrational, electro-mechanical, dissipative systems and other engineering applications.

Engineering 89.508 (MCG5108)

**Finite Element Analysis**

Review of matrix algebra and structural mechanics. Direct and variational approaches in the FE analysis of a continuum. Elastic plane stress, plane strain, axisymmetric and three-dimensional elasticity. Elementary FE programming. Isoparametric concept, conforming and non-conforming elements. Thin and thick plates. Thin and thick shells, axisymmetric shells. Steady-state field problems. Intermediate FE programming. Introduction to FE software. Applications in mechanical engineering.

Engineering 89.509 (MCG5109)

**Advanced Topics in Finite Element Analysis**

Finite elements and their solution techniques. Multilayered plate, shell and continua. Eigenvalue and transient analysis, material and geometric non-linearities. Applications to fracture mechanics. Steady and transient state heat conduction. Potential flow. Creeping flow and incompressible viscous flow with inertia.

Engineering 89.510 (MCG5110)

**Micromechanics of Solids**

Introduction. Classes of materials in micromechanics. Cartesian tensor notation. Random theory of deformation. Analysis of stress, strain and motion. The stochastic deformation process. Structured materials and intelligent systems. Experimental approaches.

Engineering 89.511 (MCG5111)

**Gas Dynamics**

Review of thermodynamics of perfect gases. Conservation equations. Wave propagation in compressible media. Normal and oblique shock waves. Prandtl-Meyer expansion fans. Applications. Ideal gas flow in ducts of variable section, friction, heat transfer. Method of characteristics. Imperfect gas effects, dissociation,

ionization. Methods of measurement.

Engineering 89.514 (MCG5114)

**Analysis and Design of Pressure Vessels**

Principles of design, materials, preliminary layout. Elastic analysis of axisymmetric shells. Discontinuity analysis. Numerical methods, nozzle-shell analysis. Plastic collapse, fatigue, fracture, creep, buckling.

Engineering 89.515 (MCG5115)

**Non-Linear Optimization**

Formulation of optimization problems. Unconstrained optimization: direct search techniques, gradient techniques. Constrained optimization: by unconstrained minimization, by direct methods. Mathematical programming. Geometric programming. Dynamic programming. Examples and applications in Mechanical Engineering topics.

Engineering 89.517 (MCG5117)

**Introduction to Composite Materials**

Review of strengthening mechanism in metals and polymers. Fibre-reinforced composite materials: strengthening mechanisms, prediction of strengths and moduli, specific properties, fracture mechanisms, toughness, fatigue, creep, effect of environment; fabrication methods and engineering applications. Laminates; mechanical properties and engineering applications.

Engineering 89.518 (MCG5118)

**Introduction to Plasticity**

The analysis of stress and strain in elastic and plastic continuum. Time independent plastic deformation. The microscopic basis of plastic behaviour. Rate dependent deformation. The effect of temperature. Materials testing. Applications.

Engineering 89.519 (MCG5119)

**Fracture Mechanics**

Stress concentration in elastic and plastic media. The energy condition, crack resistance, compliance, the J. integral. Crack arrest. Plain strain and plain stress behaviour. The microscopic aspects of crack propagation. The effect of temperature. Fatigue, stress corrosion cracking, and creep fracture. Probabilistic fracture.

Engineering 89.526 (MCG5126)

**Deformation of Materials**

The deformation and fracture properties of metals, ceramics and polymers. Introduction to dislocation theory. Rheological models. Analysis and interpretation of constant strain rate, constant stress and stress relaxation tests in terms of the material structure.

Engineering 89.529 (MCG5129)

**Hot Working of Metals**

High temperature mechanical properties in metal. Types of recovery, recrystallization and precipitation in metals and their effects on hot

strength and structure. Hot rolling metals. Selection of rolling schedules. Influence of as-rolled structures on room temperature tensile and fracture stresses, impact strength.

Engineering 89.531 (MCG5131)

**Heat Transfer by Conduction**

Steady one-dimensional systems. Equations of Bessel and Legendre. Extended surface. Fourier series and integration of partial differential equations. Steady two-dimensional systems. Steady-state numerical methods. Steady heat source systems. Steady porous systems. Transient systems; stationary and moving sources. Transient numerical methods

Engineering 89.532 (MCG5132)

**Heat Transfer by Convection**

General problems of convection. Fundamental equations. Boundary layer equations. Forced convection in laminar flow. Forced convection in turbulent flow. Free convection. Condensing and boiling. Heat transfer to liquid metals. Heat transfer in high-speed flow. Special topics.

Engineering 89.533 (MCG5133)

**Heat Transfer by Radiation**

Thermal radiation and radiation properties. Radiant interchange among surfaces separated by radiatively non-participating media. Radiant energy transfer through absorbing, emitting and scattering media. Combined conduction and radiation. Combined convection and radiation.

Engineering 89.534 (MCG5134)

**Heat Transfer with Phase Change**

Pool boiling. Hydrodynamics of two-phase flow. Flow boiling and flow boiling crisis. Instability of two-phase flow. Condensation.

Engineering 89.536 (MCG5136)

**Special Studies in Fluid Mechanics and Heat Transfer**

Current topics in the field.

Engineering 89.537 (MCG5137)

**Special Studies in Solid Mechanics and Materials**

Current topics in the field.

Engineering 89.538 (MCG 5138)

**Advanced Topics in Mechanical Engineering**

Current topics in the field.

Engineering 89.541 (MCG5141)

**Statistical Thermodynamics**

Kinetic theory of an ideal gas. The distribution of molecular velocities. Transport phenomena. Maxwell-Boltzmann statistics. Quantum mechanics. Quantum statistics. Partition functions. Partition functions and thermodynamic prop-

erties. Derivations of specific heats of gases. Gas mixtures. Law of mass action.

Engineering 89.548 (MCG5551)

**Théorie d'Écoulement Visqueux**

Dérivation des solutions exactes des équations de Navier-Stokes. Écoulement à petit nombre de Reynolds. Écoulement de Stokes. Écoulement d'Oseen. Théorie de lubrification. Couches limites laminaires. Introduction à la stabilité hydrodynamique.

Engineering 89.549 (MCG5552)

**Théorie de Turbulence**

Révision des théories fondamentales et des résultats expérimentaux des théories isotropique locale. Turbulence isotropique, contrainte homogène des écoulements, écoulements turbulents dans les tuyaux et les canaux, jets, sillages, couches limites. Diffusion turbulente. Modèles de turbulence.

Engineering 89.550 (MCG5557)

**Méthodes Numériques en Mécanique des Fluides**

Équations primitives. Méthodes de différences finies. Méthodes intégrales. Critère de stabilité. Calcul des écoulements transitoires laminaires tri-dimensionnels. Méthodes MAC de Los Alamos. Calcul des écoulements multidimensionnels turbulents. Modèles de turbulence. Méthode numérique de Gosman.

Engineering 89.551 (MCG5151)

**Laminar Flow Theory**

Derivation and exact solutions of the Navier-Stokes equations. Low Reynolds number flows, Stokes flow. Oseen flow, lubrication theory. Laminar boundary layers. Introduction to hydrodynamic stability.

Engineering 89.552 (MCG5152)

**Theory of Turbulence**

Review of the basic theories and experimental results of turbulent flow. Universal equilibrium theory, locally isotropic theories, isotropic turbulence, homogeneous shear flow, turbulent pipe and channel flow, jets, wakes, boundary layers. Turbulent diffusion of passive contaminants. Modelling of turbulence.

Engineering 89.555 (MCG5155)

**Inviscid Flow Theory**

Langrangian and Eulerian description of fluid motion. Euler equations, velocity potential, irrotational flow, stream function, singular flows. Conformal mapping, Schwarz-Christoffel theorems. Airfoil theory, circulation and lift.

Engineering 89.556 (MCG5156)

**Measurement in Fluid Mechanics**

Review of the common experimental techniques used in fluid mechanical research and applications. Flow visualization techniques. Hot-

wire anemometry. Laser-Doppler anemometry. Measurement of concentration, temperature, force, pressure.

Engineering 89.557 (MCG5157)

**Numerical Computation of Fluid Dynamics and Heat Transfer**

Governing equations. Explicit, implicit, finite difference and control volume procedures for approximating the parabolic and elliptic sets of partial differential equations and boundary conditions. Numerical solution by direct and iterative Gauss-Seidel relaxation methods. Considerations of stability, convergence, and numerical diffusion. Computational problems.

Engineering 89.558 (MCG5158)

**Industrial Fluid Mechanics**

Application of simple flows to analysis of more complex systems. Pipe and duct systems, flow separation and control, aerosols, separation of particulates from flow, cavitation, unsteady flow.

Engineering 89.559 (MCG5159)

**Advanced Production Planning and Control**

The principles of production management. Methods engineering, manufacturing control. Recording and evaluation of operations. Financial and production planning. Inventory control. Automation. Factory planning.

Engineering 89.561 (MCG5161)

**Environmental Engineering**

Thermodynamic considerations. Physiological reactions of humans to different environments. Principles of ventilation, distribution and cleaning of air. Illumination and acoustics.

Engineering 89.568 (MCG5168)

**Industrial Organization**

Principles of organization. Production processes. Organization and planning production. Evaluation of production activities. The economics of production. Planning for economy. Information engineering. Standardization.

Engineering 89.569 (MCG5169)

**Advanced Topics in Reliability Engineering**

Overview of classical reliability concepts. Fault tree construction and evaluation. Common-cause failure analysis of engineering systems. Human reliability modelling in engineering systems. Human unreliability data banks. Three state device systems. Delta-star and Mellin transforms reliability determination techniques. Models to compute reliability of on-surface transportation vehicles. Reliability techniques applications in advanced engineering systems.

Engineering 89.570 (MCG5170)

**CAD/CAM**

History and current technologies of CAD/CAM.

Design software; graphical representation analysis, and optimization. Parameter design and software integration. Course is project oriented.

Engineering 89.571 (MCG5171)

**Applied Reliability Theory**

Coherent systems. Paths and cuts representation. State-space representation. Observability and controllability. Failure rate. Repair time. System reliability estimation: binomial model. Strength stress model. Failure detection and isolation. Multiple sensors. Model based methods. Expert system approach. Analytical redundancy. Applications.

Engineering 89.572 (MCG5172)

**Introduction to Management of Automation (Robotics and Numerical Control)**

Administrative concept of automation, robotics and numerical control; elements of flexible manufacturing systems. Process design in automation. Role of automation in the administration of manufacturing and project engineering. Optimization in the design of computer assisted manufacturing (CAM). State of art review.

Engineering 89.573 (MCG5173)

**Systems Engineering and Integration**

State space representation. Observability, controllability, state estimation. Parameter identification. Steady-state and transient performance. Stability. Monitoring and regulation. Discretization effects. System integration. Bandwidth coordination. Technological systems design examples.

Engineering 89.576 (MCG5176)

**Industrial Control Systems**

Concept, analysis and design of classical and modern industrial control systems. Computer based control systems for robotics, automation, manufacturing and instrumentation applications. Design project of industrial control and automation systems. Not accessible to students who have taken MCG4108.

Engineering 89.577 (MCG 5177)

**Robot Mechanics**

Robotics overview. Transformations. Basics of robot kinematics, statics and dynamics. Introduction to practical robots, control and programming. Project in analysis, design or application of manipulators. Not accessible to students who have taken MCG 4132.

Engineering 89.578 (MCG5178)

**Advanced Topics in CAD/CAM**

Overview of totally integrated CAD/CAM systems. Details of design and manufacturing soft-

ware tools. Methods of linking design and manufacturing tools to form an integrated CAD/CAM system. Students will undertake projects which will provide them with hands-on experience.

Engineering 89.579 (MCG5179)

### **Flexible Manufacturing**

Types of manufacturing systems. The concept of flexible manufacturing. Overview of the basic components of flexible manufacturing systems: NC machine tools, programable manipulators, guided vehicles, storage and retrieval warehouses. Machine cells. System layout and reliability. Group technology. Workpieces and tools routing. Operations sequencing.

Engineering 89.580 (MCG5180)

### **Advanced Topics in Composite Materials**

Computer automated manufacturing techniques. Advanced topics in lamination theory. Interlaminar stresses and free edge effects. Lamina and laminate failure theories. Principles of non-destructive testing including damage assessment. Mechanics and failure of particle, flake, thermoplastic and metal matrix composites.

Engineering 89.581 (MCG5181)

### **Advanced Vibrations**

Kinematics of vibrations, the single-degree-of-freedom system, without and with damping, two degrees of freedom, several degrees of freedom, vibration of shafts, critical speeds, complex presentation, influence coefficients, matrix method, stability of solution, approximate methods.

Engineering 89.582 (MCG5182)

### **Theory of Elastic Instability**

Considerations of instability with respect to small deformation. Differential equations for linear elements. Conservative and non-conservative force systems. Energy methods. Instability in beams. Instability of elements curved in a plane. Applications of trigonometric series. Stability of linear members in the inelastic zone.

Engineering 89.585 (MCG5185)

### **Multivariable Digital Control**

Quantization. Z-Transform. State equations. Jordan canonical form. Multirate and

nonsynchronous samplings. Controllability and observability of digital systems. Digital controllers design using bilinear transformation. Digital PID controller. Stability. Optimal control of digital systems. Examples of controlling mechanical system actuators.

Engineering 89.586 (MCG5186)

### **Non-Linear Discontinuous Dynamics and Control**

Hamiltonian dynamics. Hamiltonian control systems. Lyapunov dynamics. Decoupling. Phase space analysis. Switching and sliding mode control. Boundary layer continuous approximation. Actuator, sensors and controller requirements. Manipulation control examples.

Engineering 89.591 (MCG5191)

### **Combustion in Premixed Systems**

Stoichiometry, thermo-chemistry, ignition, flame propagation, flame stabilization, diffusion flames, turbulent combustion, modelling.

Engineering 89.592 (MCG5192)

### **Combustion in Diffusion Systems**

Gaseous jet flames, combustion of liquid droplets, atomization, spray flames, coal combustion, fluidized bed combustion.

MCG 6000

### **Mechanical Engineering Report**

For students in the course work master's program working on the Engineering Report.

MCG 7999

### **M.A.Sc. Thesis**

For students working towards their master's thesis.

MCG 9997

### **Preparation for Ph.D. Thesis Proposal.**

Following completion of the comprehensive examination, registration required for all Ph.D. candidates until the thesis proposal is accepted by the advisory committee.

MCG 9998

### **Preparation for Ph.D. Comprehensive Examination**

Registration required for all Ph.D. candidates until the comprehensive examination is passed.

MCG 9999

### **Ph.D. Thesis**

For students working towards their Ph.D. thesis.

## School for Studies in Art and Culture: Music

Loeb Building A911  
Telephone: 520-5770  
Fax: 520-3905

### The School St. Patrick's Building 423

**Director,** Bryan Gillingham

**Assistant Director (Music),** Jennifer Giles

Music offers courses at the graduate level in musicology and ethnomusicology. These include courses offered in cooperation with the School of Canadian Studies. Full use is made of the resources of the National Library, the Public Archives, and the National Museum of Civilization.

Dr. Elaine Keillor is a lecturer in Canadian music with Dr. Helmut Kallmann (former Chief Music Librarian, National Library) as Adjunct Professor.

Courses in the sociology and aesthetics of music are offered by Dr. John Shepherd and Dr. Geraldine Finn.

### Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Music 30.501W1

#### Theories of Music as Culture

A survey of major theories in musicology, ethnomusicology, feminism, semiotics, structuralism, poststructuralism, cultural studies and psychoanalysis as they have been applied to the understanding of the culture-specific character of sound in music.

**Prerequisite:** Permission of the School for Studies in Art and Culture (Music).

Music 30.505F1

#### Feminism and Musicology

Applying specific feminist approaches, this course focuses upon recent developments in psychoanalytic theory, deconstruction and post-colonial criticism to examine the structures and significances of music in contemporary culture and its relationship to politics, ideology, and power.

**Prerequisite:** Permission of the School for Studies in Art and Culture (Music).

Music 30.510T2

#### History of Canadian Music I

Selected aspects of notated Canadian music from 1600 to the present; liturgical music; social and economic conditions of Canadian musical life; regional studies; individual composers and performers.

**Prerequisite:** Permission of the School for Studies in Art and Culture (Music).

Music 30.511F1

#### History of Canadian Music II

Anglo- and Franco-folk music traditions in Canada, past and present.

**Prerequisite:** Permission of the School for Studies in Art and Culture (Music).

Music 30.512W1

#### History of Canadian Music III

The music of various ethnic minorities in Canada with special emphasis on the traditions of the First Peoples.

**Prerequisite:** Permission of the School for Studies in Art and Culture (Music).

Music 30.515F1

#### History of Canadian Music IV

A survey of the history of French-Canadian popular music from the beginnings of Nouvelle France to the present. Special attention is paid to the social and political contexts of music making in Québec.

**Prerequisites:** Permission of the School for Studies in Art and Culture (Music). A good reading ability in French is essential.

# Neuroscience

Life Sciences Research Building 325  
 Telephone: 520-4017  
 Fax: 520-3667  
 Email: kim\_cook@carleton.ca

## The Institute

**Director, B.A. Pappas**

Neuroscience is a dynamic academic discipline that includes physiological, anatomical, biochemical, and behavioural studies of the nervous system. At Carleton University, graduate neuroscience research and training are co-ordinated by the Institute of Neuroscience. Both M.Sc. and Ph.D. degrees, with a Specialization in Behavioural Neuroscience, are offered through either the Departments of Psychology or Biology with supervision by one of the faculty members of the Institute.

## Members of the Institute

- Hymie Anisman, *Stress, Brain-Immune Interactions, Depression*
- Jennifer Arnold, *Neuronal Apoptosis, Gap Junctions (Adjunct)*
- Steffany Bennett, *Neurodegeneration, Apoptosis (Adjunct)*
- James Cheetham, *Membrane Biochemistry, Neurotransmitter Release*
- Bin Hu, *Thalamic Neurophysiology, Synaptic Signalling (Adjunct)*
- Jack Kelly, *Central Auditory System, Electrophysiology and Behaviour*
- Dan McIntyre, *Epilepsy, Kindling, Learning and Memory*
- Zul Merali, *Peptides, Feeding Behaviour (Adjunct)*
- Bruce Pappas, *Brain Development, Dementia, Ischemia*
- Michael Poulter, *Electrophysiology, Neurochemistry, Molecular*
- Shu Hui Wu, *Auditory Brainstem, Brain Slice Neurophysiology*
- Robert M. Zacharko, *Intracranial Self-stimulation, Stress, Depression, Dopamine, Anhedonia*

## The Specialization in Behavioural Neuroscience

**Coordinator of the Specialization, B.A. Pappas**

Application for admission, scholarships, and teaching assistantships should be made through

either the Departments of Psychology or Biology, whichever is most appropriate to a student's research interest, and should indicate the intention to specialize in behavioural neuroscience. This specialization is a collaboration of the Departments of Biology and Psychology at Carleton University, the School of Psychology at the University of Ottawa and the Institute of Mental Health Research (Psychiatry) at the University of Ottawa. It is intended to augment the research and training which the student receives and to provide opportunity in clinical neuroscience.

## Master's Program

### Admission Requirements

The requirements for admission to the master's neuroscience specialization are as follows:

\* Prior admission to the master's program of the Psychology or Biology department.

\* A letter of recommendation to the Director of the Institute from a faculty member of the Institute of Neuroscience, indicating the willingness of the faculty member to supervise the candidate's research program.

\* Recommendation of admission by the graduate committee representative(s) from the Institute of Neuroscience faculty.

Students with less than a high honours average in their undergraduate and graduate courses will not normally be recommended for admission.

### Program Requirements

\* Fulfillment of the requirements of the master's program of either Psychology or Biology Department

\* Successful completion of Psychology 49:520 (Biology 61:534)

\* Thesis research must concern a neuroscience topic and be supervised by a member of the Institute

## Doctor of Philosophy

### Admission Requirements

Admission requirements to the Ph.D. neuroscience specialization are as follows:

\* Prior admission to the Ph.D. program of the Psychology or Biology department.

\* A letter of recommendation from a participating faculty member of the neuroscience specialization, indicating the willingness of the faculty member to supervise the candidate's research program

\* Recommendation of admission by the graduate committee representative(s) from the Institute of Neuroscience faculty.

\* Students with less than a high honours standing in their undergraduate and graduate courses will not normally be recommended for admission.

## Program Requirements

Fulfillment of the requirements of the Ph.D. program of either the Psychology or Biology Department. A credit in Neuroscience Techniques (49.624) may be substituted for one of the following 0.5 credit courses normally required to satisfy the Psychology Ph.D. program requirements in statistics: 49.541, 49.542, 49.543, 49.546

\* Successful completion of Psychology 49.520 (Biology 61.534), Psychology 49.620 (Biology 61.633) and at least one credit in Psychology 49.624 (Biology 61.624)

Thesis research must concern a neuroscience topic and be supervised by a member of the Institute.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Neuroscience courses are available through the primary departments. Course offerings vary slightly from year to year and a complete listing can be obtained from the specialization coordinator.

The following are the core courses of the curriculum.

Psychology 49.520T2 (Biology 61.534)

### Basics of Neuroscience

A comprehensive neuroscience course from cellular levels to neural systems and behaviour. Topics covered will include aspects of neuroanatomy, neurophysiology, neuropharmacology and behavioural and cognitive neuroscience. (Also listed as PSY6201 at the University of Ottawa)

Psychology 49.620T2 (Biology 61.633)

### Advanced Seminar in Neuroscience

A seminar focusing on the active research areas and interests of faculty, guest lecturers and graduate students and as well current trends in diverse areas of neuroscience.

Psychology 49.624 F1,W1,S1 (Biology 61.624)

### Neuroscience Techniques

Completion of a research project carried out under the supervision of a neuroscience faculty member. The student will learn a new neuroscience technique and apply it to a research objective. May be repeated for different projects. Students must obtain approval from the Director of the Neuroscience Specialization

Psychology 49.630 F1, W1

### Special Topics in Psychology

An in depth study of current topics in neuroscience. Course content varies yearly and has recently included cognitive neuroscience, neuropharmacology, neurodegeneration, behavioural medicine and molecular neuroscience.

# Philosophy

Dunton Tower 2123  
 Telephone: 520-2110  
 Fax: 520-3962  
 Website [www.carleton.ca/philosophy/](http://www.carleton.ca/philosophy/)

## The Department

**Chair of the Department, Jay Drydyk**

**Supervisor of Graduate Studies, Richard Manning**

The Department of Philosophy offers programs of study leading to the degree of Master of Arts.

## Qualifying-Year Program

Applicants who do not hold an Honours degree (or the equivalent) will be required to register in a qualifying-year program before proceeding to the master's program.

The regulations governing the qualifying year are outlined in the General Regulations section of this Calendar (see p.55).

## Master of Arts

### Admission Requirements

The minimum requirement for admission to the master's program is an Honours B.A. degree (or the equivalent) in Philosophy, with at least B+ standing (or the equivalent). Qualifying-year and M.A. applicants from an institution other than Carleton University must submit two papers.

### Program Requirements

The specific program requirements for master's candidates are the following:

\* Philosophy 32.580

\* A thesis equivalent to 2.0 credits, which must be defended at an oral examination; or a research essay equivalent to 1.0 credit

\* 2.0 credits (or 3.0 in the case of students following the research essay option), a minimum of 1.0 by tutorial, in at least three of the following study areas: studies in the history of philosophy; studies in the work of an individual philosopher; studies in logic, epistemology, or metaphysics; studies in selected problems in philosophy.

## Guidelines for Completion of Master's Degree

Full-time students enrolled in the 5.0 credit M.A. program are expected to complete Philosophy 32.580 and 2.0 credits by the end of the second term of study. The thesis or research essay approval form should be submitted by the end of the fourth week of the third term of study. Those students choosing the research essay option should complete 1.0 additional credits by the end of the third term of study. All full-time students are expected to submit the thesis or research essay by the end of the fourth term of study.

Part-time students enrolled in the 5.0 credit M.A. program are expected to complete Philosophy 32.580 and 2.0 credits by the end of the third year of study. The thesis or research essay approval form should be submitted by the end of the second month of the fourth year of study. Those students choosing the research essay option should complete 1.0 additional credit by the end of the fourth year of study. All part-time students are expected to submit the thesis or research essay by the end of the fifth year of study.

## Other Courses

A maximum of 1.0 credit may be selected from courses offered at the 400-level, or in a related field, or at another university.

Each year, the department offers 400-level undergraduate 0.5 credit courses, which are open to students in the qualifying year and, with permission, to students in the M.A. program. For courses offered in 2001-2002, please consult the Undergraduate Calendar.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

The following graduate courses are open to students in the M.A. program and, with permission, to students in the qualifying-year program. In tutorial courses, at least five two-hour tutorial sessions will be required.

## Tutorial Courses

Philosophy 32.504F1

### **Tutorial in the History of Philosophy I**

Detailed study of a period or issue in the history of philosophy.

Philosophy 32.505W1

### **Tutorial in the History of Philosophy II**

Detailed study of a period or issue in the history of philosophy.

Philosophy 32.514F1

### **Tutorial in the Work of an Individual Philosopher I**

A critical and systematic study of the work of an individual philosopher.

Philosophy 32.515W1

### **Tutorial in the Work of an Individual Philosopher II**

A critical and systematic study of the work of an individual philosopher.

Philosophy 32.524F1

### **Tutorial in Logic, Epistemology, or Metaphysics I**

An attempt to find a solution to a specific problem in logic, epistemology, or metaphysics.

Philosophy 32.525W1

### **Tutorial in Logic, Epistemology, or Metaphysics II**

An attempt to find a solution to a specific problem in logic, epistemology, or metaphysics.

Philosophy 32.534F1

### **Tutorial in Selected Problems of Philosophy I**

An attempt to find a solution to a specific problem in some area other than logic, epistemology, or metaphysics.

Philosophy 32.535W1

### **Tutorial in Selected Problems of Philosophy II**

An attempt to find a solution to a specific problem in some area other than logic, epistemology, or metaphysics.

## Seminar Courses

Philosophy 32.510F1

### **Advanced Problems in Legal Philosophy**

Studies in legal theory and analyses of law advanced by Hart, Dworkin, and others, and legal concepts: for example, principles, rights, duties, liability, etc. Precise course content will vary from year to year and will be announced at the beginning of the term. (Also listed as Law 51.510)

Prerequisites: Philosophy 32.311★ and 32.312★ (Law 51.311★ and 51.312★), or permission of the relevant department.

Philosophy 32.520F1 or W1

### **Seminar in Philosophy of Mind and/or Philosophical Semantics**

A detailed study of an issue or the work of selected philosophers in the general area of philosophy of mind and/or philosophical semantics. Also offered at the undergraduate level, with different requirements, as Philosophy 32.413★ or 32.414★, for which additional credit is precluded.

Philosophy 32.530F1 or W1

### **Seminar in Value Theory**

A detailed study of an issue or the work of selected philosophers in the general area of value theory. Also offered at the undergraduate level, with different requirements, as Philosophy 32.415★ or 32.416★, for which additional credit is precluded.

Philosophy 32.540F1 or W1

### **Seminar in German Idealism, Its Influence and/or Reactions to It**

A detailed study of an issue or the work of selected philosophers in the general area of German idealism, its influence and/or reactions to it. Also offered at the undergraduate level, with different requirements, as Philosophy 32.406★, for which additional credit is precluded.

Philosophy 32.580T2

### **Graduate Seminar**

The first term will be devoted to a single issue or group of interrelated issues. In the second term, a variety of topics will be discussed. Issues covered in this course will vary from year to year.

Philosophy 32.598F2,W2,S2  
**Research Essay**

Philosophy 32.599F4,W4,S4  
**M.A. Thesis**

# Ottawa-Carleton Institute for Physics

Herzberg Building 2240  
Telephone: 520-3515  
Fax: 520-5613  
Email:  
grad\_supervisor@physics.carleton.ca

Université d'Ottawa  
University of Ottawa



Carleton University

## The Institute

**Director of the Institute,** Richard Hodgson

**Associate Director,** To be announced

Students pursuing studies in physics at the M.Sc. and Ph.D. levels in the Ottawa area do so in a cooperative program that combines the resources of the Departments of Physics of Carleton University and the University of Ottawa. The two universities have a joint committee supervising the programs, regulations, and student admissions.

Students are admitted for graduate work under the general regulations of the Institute, which include criteria related to academic performance, research experience, and referees' appraisals. The choice of program and/or research project and supervisor will determine the student's primary campus location.

At Carleton, the research areas of physics available for programs leading to the M.Sc. or the Ph.D. degree include high energy physics and medical physics. In high energy physics, both theoretical and experimental programs are available. At the University of Ottawa, the research interests include condensed matter physics, biophysics, non-linear dynamics, statistical mechanics, materials science, photonics, and surface physics. The graduate courses offered on the two campuses match this complementarity of research interests, and the courses listed below are therefore grouped to reflect the different emphases on the two campuses.

In addition, the M.Sc. degree in the area of physics in modern technology is offered at both campuses. This program requires a work term placement rather than a thesis.

The list below of all members of the Institute along with their research interests can be used as a guide to possible supervisors. For students in the medical physics stream, research supervision may be provided by members of other institutions in the area, such as hospitals, cancer clinics, and government laboratories.

Requests for information and completed applications should be sent to the Director or Associate Director of the Institute. Detailed information is available at our web site: [www.ocip.carleton.ca](http://www.ocip.carleton.ca)

## Members of the Institute

The home department of each member of the Institute is indicated by (C) for the Department of Physics, Carleton University and (O) for the Department of Physics, University of Ottawa.

- J.C. Armitage, *High Energy Physics, Instrumentation* (C)
- Xiaoyi Bao, *Photonics* (O)
- Ian Calder, *Experimental Condensed Matter* (O- Adjunct)
- Ian Cameron, *Medical Physics* (C-Adjunct)
- R.K. Carnegie, *Experimental High Energy Physics* (C)
- Sylvain Charbonneau, *Semiconductor Physics* (O-Adjunct)
- Liang Chen, *Theoretical Condensed Matter, Photonics* (O)
- R.L. Clarke, *Medical Physics* (C-Adjunct)
- Joanna Cygler, *Medical Physics* (C-Adjunct)
- Robert deKemp, *Medical Physics* (C-Adjunct)
- Serge Desgreniers, *High Pressure Physics* (O)
- Marie D'Iorio, *Condensed Matter* (O-Adjunct)
- Madhu Dixit, *Experimental High Energy Physics* (C-Adjunct)
- Simon Fafard, *Semiconductor Physics* (O-Adjunct)
- Emery Fortin, *Semiconductor Physics* (O)
- L.H. Gerig, *Medical Physics* (C-Adjunct)
- Stephen Godfrey, *Theoretical Particle Physics* (C)
- C.L. Greenstock, *Medical Physics* (C-Adjunct)
- C.K. Hargrove, *Experimental High Energy Physics* (C-Adjunct)
- Pawel Hawrylak, *Theoretical Condensed Matter* (O-Adjunct)
- R.J. Hemingway, *Experimental High Energy Physics* (C-Adjunct)
- R.J.W. Hodgson, *Theoretical Nuclear Physics* (O)
- B.J. Jarosz, *Medical Physics* (C)
- P.C. Johns, *Medical Physics* (C)
- Béla Joós, *Theoretical Condensed Matter* (O)
- Pat Kalyniak, *Theoretical Particle Physics* (C)
- Dean Karlen, *Experimental High Energy Physics* (C)
- Gilles Lamarche, *Low Temperature Physics* (O-Adjunct)

- M.A.R. LeBlanc, *Superconductivity* (O)
- Ivan L'Heureux, *Nonequilibrium Processes in Nonlinear Systems* (O)
- B.A. Logan, *Nuclear Physics* (O)
- André Longtin, *Nonlinear Dynamics, Biophysics* (O)
- M.J. Losty, *Experimental High Energy Physics* (C-Adjunct)
- Barry McKee, *Medical Physics* (C-Adjunct)
- H.J.A.F. Mes, *Experimental High Energy Physics* (C-Adjunct)
- Cheng Ng, *Medical Physics* (C-Adjunct)
- Tony Noble, *Experimental High Energy Physics* (C-Adjunct)
- F.G. Oakham, *Experimental High Energy Physics* (C)
- Peter Piercy, *Condensed Matter Physics* (O)
- G.P. Raaphorst, *Medical Physics* (C-Adjunct)
- D.G. Rancourt, *Solid State Magnetism* (O)
- D.W.O. Rogers, *Medical Physics* (C-Adjunct)
- Alain Roth, *Condensed Matter* (O-Adjunct)
- Giles Santyr, *Medical Physics* (C)
- Ken Shortt, *Medical Physics* (C-Adjunct)
- W.D. Sinclair, *Solar Neutrino Physics* (C)
- G.W. Slater, *Polymer Physics* (O)
- A.K.S. Song, *Theoretical Studies in Solid State* (O-Adjunct)
- Z.M. Stadnik, *Electronic Structure and Magnetism* (O)
- M.K. Sundaresan, *Theoretical Particle Physics* (C)
- John Tse, *Theoretical Material Sciences* (O-Adjunct)
- Y.P. Varshni, *Theoretical Solid State, Astrophysics* (O)
- P.J.S. Watson, *Theoretical Particle Physics* (C)
- A.J. Walker, *Medical Physics* (C-Adjunct)
- Robyn Williams, *Semiconductor Physics* (C-Adjunct)
- J.C. Woolley, *Semiconductor Physics* (O)

## Master of Science

An Honours B.Sc. in Physics or a closely related field at a standard acceptable to the two universities is normally required for admission to the M.Sc. program. The admissions committee may require students to take an orientation examination during the first weeks of resi-

dence. The results of this examination may indicate the need for a student to register in undergraduate courses to fill gaps in his/her knowledge. It is strongly recommended that all students have had at least one course in computing.

## Program Requirements

The options for the M.Sc. program are described below. Normally the requirements for the research M.Sc. with thesis will consist of:

- \* 2.5 credits of course work
- \* A thesis (2.5 credits) defended at an oral examination
- \* Participation in the seminar series of the Institute

Students with academic preparation particularly well suited for their chosen field of study may have their course credit requirements reduced to 2.0 credits. In this case, a 3.0 credit thesis will be required.

The minimum number of courses is 1.5 credits. At least 1.0 credit must consist of lecture courses at the graduate level. The courses 75.590 and 75.591 are courses on Selected Topics, normally given as directed studies, and cannot fulfill this lecture course requirement. Most students will be expected to take 75.502W1. Students in the theoretical or high energy physics streams will normally include 75.561F1, 75.562W1, 75.571F1 and 75.572W1 among their courses.

For the medical physics stream the three areas of specialization are: imaging, therapy, and biophysics. All students are required to take 75.523F1 and 0.5 credit appropriate physics course from an area of physics other than medical physics. In addition:

- \* For imaging, 75.524W1 is required
- \* For therapy, 75.526W1 is required
- \* For biophysics, 0.5 credit chosen from 75.527F1, cell biology, physiology or anatomy is required

Students with a medical/health physics background may have the selection of required courses adjusted to reflect their preparation and may receive advanced standing for equivalent courses.

A selection from 75.528W1, 75.529F1, or, (with approval) other appropriate courses in physics, engineering, computer science, business or law can be used to complete the program.

In special cases, the requirements may also be met by taking 5.0 credits of course work and no thesis. 1.0 credit must be the selected topics course 75.590T2. A comprehensive examination and participation in the seminar series will also be required.

Students in the physics in modern technology stream must successfully complete the following requirements:

- \* 3.0 credits of course work
- \* Physics 75.595F2,W2,S2
- \* Students will normally include two of 75.502W1, 74.503, 74.504, 74.505 among their courses.

Students enrolled in the physics in modern technology stream are required to complete a work term rather than a research thesis. Students in this stream who wish to pursue a research degree should consult with the graduate supervisor. Although every effort is made to find a work term position for every student enrolled in the physics in modern technology stream, no guarantee of employment can be made. To minimize the likelihood of a work term position not being found, enrolment will be limited to reflect the availability of work term placements. In the event that a work term placement cannot be found, students may fulfill the M.Sc. requirements with courses only as described above.

Candidates admitted to the M.Sc. program with more than the minimum course requirements may be permitted to credit towards the degree a maximum of 1.0 credit at the senior undergraduate level. This maximum does not apply to qualifying-year students.

## Guidelines for Completion of Master's Degree

With the exception of those students in the physics in modern technology stream, full-time master's candidates are expected to complete all requirements in six terms of registered full-time study. Part-time master's candidates are expected to complete their degree requirements within an elapsed period of three to four calendar years after the date of initial registration.

Students in the physics in modern technology stream are normally expected to complete all their requirements in three successive terms of registered full-time study.

## Doctor of Philosophy

### Admission Requirements

An M.Sc. in Physics, or a closely related field, is normally required for admission into the Ph.D. program. Students who have been admitted to the M.Sc. program may be permitted to transfer into the Ph.D. program if they demonstrate academic abilities for advanced research in their field.

In exceptional cases, an outstanding student who has completed the honours B.Sc. will also be considered.

### Program Requirements (from M.Sc.)

The normal requirements for the Ph.D. degree (after M.Sc.) are:

- \* A minimum of 2.0 credits at the graduate level
- \* Students who lack any of the relevant courses recommended for the M.Sc. program will be expected to have completed them (or the equivalents) by the end of their Ph.D. program. In addition, students in high energy physics or theoretical physics should complete 75.661 and 75.662, and students in medical physics should complete 75.529.
- \* A comprehensive examination designed to demonstrate overall ability in physics and in the candidate's research area, normally within the first year of study. This takes the form of a written examination followed, if necessary, by an oral examination.

\* A thesis which will be defended at an oral examination. The examining board for all theses will include members of the Institute from both Departments of Physics. The external examiner of the thesis will be external to both Departments of Physics.

\* Participation in the seminar series of the Institute

## Guidelines for Completion of Doctoral Degree

Full-time Ph.D. candidates admitted on the basis of an M.Sc. are expected to complete all requirements within an elapsed period of four to five years after the date of initial registration. Part-time Ph.D. candidates are expected to complete all requirements within an elapsed period of six years after the date of initial registration.

### Residence Requirements

For the M.Sc. degree:

- \* At least one year of full-time study (or the equivalent)

For the Ph.D. degree (from B.Sc.):

- \* At least three years of full-time study (or the equivalent)

For the Ph.D. degree (from M.Sc.):

- \* At least two years of full-time study (or the equivalent)

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

In the listing below, courses are grouped to reflect the varying research interests of the two universities. If there is small enrollment, a course may be offered as a reading course.

**The following course is offered either at Carleton or the University of Ottawa:**

Physics 75.571F1 (PHY5170)

### **Intermediate Quantum Mechanics with Applications**

Angular momentum and rotation operations; Wigner and Racah coefficients; several and many electron problem in atoms; variational and Hartree-Fock formalism; introduction to second quantized field theory; scattering theory.

Prerequisites: Physics 75.477★ and 75.478★ and permission of the Department.

**The following courses are offered only at Carleton:**

Physics 75.502W1 (PHY5344)

### **Computational Physics**

Computational methods used in analysis of experimental data. Introduction to probability and random variables. Monte Carlo methods for simulation of random processes. Statistical methods for parameter estimation and hypothesis tests. Confidence intervals. Multivariate data classification. Unfolding methods. Examples taken primarily from particle and medical physics. Also offered at the undergraduate level, with different requirements, as Physics 75.487, for which additional credit is precluded. Prerequisite: An ability to program in FORTRAN, Java, C, or C++ and permission of the Department.

Physics 75.511F1 (PHY8111)

### **Classical Mechanics and Theory of Fields**

Hamilton's principle; conservation laws; canonical transformations; Hamilton-Jacobi theory; Lagrangian formulation of classical field theory. Prerequisite: Permission of the Department.

Physics 75.522W1 (PHY8122)

### **Special Topics in Molecular Spectroscopy**

Topics of current interest in molecular spectroscopy. In past years, the following areas have been covered: electronic spectra of diatomic and triatomic molecules and their in-

terpretation using molecular orbital diagrams; Raman and resonance Raman spectroscopy; symmetry aspects of vibrational and electronic levels of ions and molecules in solids; the presence of weak and strong resonant laser radiation. (Also listed as Chemistry 65.509/CHM8150).

Prerequisite: Permission of the Department.

Physics 75.523F1 (PHY5161)

### **Medical Radiation Physics**

Basic interaction of electromagnetic radiation with matter. Sources: X-ray, accelerators, nuclear. Charged particle interaction mechanisms, stopping powers, kerma, dose. Introduction to dosimetry. Units, measurements, dosimetry devices.

Prerequisite: Permission of the instructor.

Physics 75.524W1 (PHY5112)

### **Physics of Medical Imaging**

Outline of the principles of transmission X-ray imaging, computerized tomography, nuclear medicine, magnetic resonance imaging, and ultra-sound. Physical descriptors of image quality, including contrast, resolution, signal-to-noise ratio, and modulation transfer function are covered and an introduction is given to image processing.

Prerequisites: Physics 75.523 and 75.423★, or permission of the Department.

Physics 75.526W1 (PHY5164)

### **Medical Radiotherapy Physics**

Terminology and related physics concepts. Bragg-Gray, Spencer-Attix cavity theories, Fano's theorem. Dosimetry protocols, dose distribution calculations. Radiotherapy devices, hyperthermia.

Prerequisite: Physics 75.523 and permission of the Department.

Physics 75.527F1 (PHY5165)

### **Radiobiology**

Introduction to basic physics and chemistry of radiation interactions, free radicals, oxidation and reduction, G values. Subcellular and cellular effects: killing, repair, sensitization, protection. Measurement methods. Survival curve models. Tissue effects, genetic and carcinogenic effects, mutations, hazards. Cancer therapy. Radiation protection considerations.

Prerequisite: Physics 75.523 must have been taken, or be taken concurrently and permission of the Department.

Physics 75.528W1 (PHY5163)

### **Radiation Protection**

Biophysics of radiation hazards, dosimetry and instrumentation. Monitoring of sources, planning of facilities, waste management, radiation safety, public protection. Regulatory agencies. Prerequisite: Physics 75.523 and permission of the Department.

Physics 75.529F1 (PHY5166)

### **Medical Physics Practicum**

Hands-on experience with current clinical medical imaging and cancer therapy equipment, and dosimetry and biophysics instrumentation. The course requires completion of experimental projects on medical imaging, radiotherapy, dosimetry, and biophysics, conducted at local clinics and NRC laboratories.

Prerequisites: Physics 75.523. Also, as appropriate to the majority of projects undertaken, one of Physics 75.524, 75.526, 75.527, or other biophysics courses, or permission of the Department.

Physics 75.532W1 (PHY8132)

### **Classical Electrodynamics**

Covariant formulation of electrodynamics; Lienard-Wiechert potentials; radiation reaction; plasma physics; dispersion relations.

Prerequisite: Physics 75.437★ and permission of the Department.

Physics 75.561F1 (PHY5966)

### **Experimental Techniques of Nuclear and Elementary Particle Physics**

The interaction of radiation and high energy particles with matter; experimental methods of detection and acceleration of particles; use of relativistic kinematics; counting statistics.

Prerequisites: Physics 75.437★ and 75.477★ and permission of the Department.

Physics 75.562W1 (PHY5967)

### **Physics of Elementary Particles**

Properties of leptons, quarks, and hadrons. The fundamental interactions. Conservation laws; invariance principles and quantum numbers. Resonances observed in hadron-hadron interactions. Three body phase space. Dalitz plot. Quark model of hadrons, mass formulae. Weak interactions; parity violation, decay of neutral kaons; CP violation; Cabibbo theory. Also offered at the undergraduate level, with different requirements, as Physics 75.462★, for which additional credit is precluded.

Prerequisite: Physics 75.477★ and permission of the Department.

Physics 75.564W1 (PHY8164)

### **Intermediate Nuclear Physics**

Properties of the deuteron and the neutron-proton force. Nucleon-nucleon forces, isospin and charge independence. Nuclear models. Scattering theory. Interpretation of n-p and p-p scattering experiments. Interaction of nucleons with electrons. Interaction of nuclei with radiation.

Prerequisite: Physics 75.468★ and permission of the Department.

Physics 75.572W1 (PHY8172)

### **Relativistic Quantum Mechanics**

Relativistic wave equations. Expansion of S matrix in Feynman perturbation series. Feynman rules. An introduction to quantum electrodynamics with some second quantization. Gauge

theories. May include introduction to Standard Model.

Prerequisite: Physics 75.571 and permission of the Department.

Physics 75.581F1 (PHY5140)

### **Methods of Theoretical Physics I**

This course and Physics 75.582 are designed for students who wish to acquire a wide background of mathematical techniques. Topics can include complex variables, evaluation of integrals, approximation techniques, dispersion relations, Padé approximants, boundary value problems, Green's functions, integral equations.

Physics 75.582W1 (PHY5141)

### **Methods of Theoretical Physics II**

This course complements 75.581. Topics include group theory, discussion of SU2, SU3, and other symmetry groups. Lorentz group.

Physics 75.590T2 (PHY8290)

### **Selected Topics in Physics (M.Sc.)**

A student may, with the permission of the Department, take more than one selected topic, in which case each full course is counted for credit.

Prerequisite: Permission of the Department.

Physics 75.591F1, W1, S1 (PHY8191)

### **Selected Topics in Physics (M.Sc.)**

Prerequisite: Permission of the Department.

Physics 75.595F2, W2, S2 (PHY5495)

### **Physics in Modern Technology Work Term**

Practical experience for students enrolled in the physics in modern technology stream. To receive course credit, students must receive satisfactory evaluations for their work term employment. Written and oral reports describing the work term project are required.

Prerequisites: Registration in the physics in modern technology stream of the M.Sc. program and permission of the Department.

Physics 75.599F, W, S (PHY7999)

### **M.Sc. Thesis**

Prerequisite: Permission of the Department.

Physics 75.661 (PHY8161)

### **Particle Physics Phenomenology**

This course covers much of the required knowledge for research in particle physics from both the experimental and theoretical points of view. Topics may include: standard model, parton model, quark model, hadron spectroscopy, and tests of QCD.

Prerequisite: Physics 75.562 and permission of the Department.

Physics 75.662 (PHY8162)

### **Advanced Topics in Particle Physics Phenomenology**

This course will consist of a variety of seminars and short lecture courses, and will cover topics of immediate interest to the research program of the department.

Prerequisite: Permission of the Department.

Physics 75.671F1 (PHY8173)

**Quantum Electrodynamics**

Relativistic quantum field theory; second quantization of Bose and Fermi fields; reduction and LSZ formalism; perturbation expansion and proof of renormalizability of quantum electrodynamics; calculations of radiative corrections and applications.

Prerequisites: Physics 75.511, 75.532, 75.571 and 75.572 and permission of the Department.

Physics 75.690T1 (PHY8490)

**Selected Topics in Physics (Ph.D.)**

Prerequisite: Permission of the Department.

Physics 75.691F1, W1 (PHY8391)

**Selected Topics in Physics (Ph.D.)**

Prerequisite: Permission of the Department.

Physics 75.699F, W, S (PHY9999)

**Ph.D. Thesis**

Prerequisite: Permission of the Department.

**The following courses are offered only at the University of Ottawa:**

Physics 74.501 (PHY5130)

**Experimental Characterization Techniques in Materials Science, Physics, Chemistry, and Mineralogy**

Survey of experimental techniques used in materials science, condensed matter physics, solid state chemistry, and mineralogy to characterize materials and solid substances. Diffraction. Spectroscopy. Microscopy and imaging. Other analytic techniques.

Prerequisite: Permission of the Department.

Physics 74.503 (PHY5342)

**Computer Simulations in Physics**

This course covers advanced numerical methods used to study large scale problems in the natural sciences, with emphasis on Molecular Dynamics, Langevin Dynamics and Brownian Dynamics methods. Examine the use of different thermodynamic ensembles, to compute experimentally relevant physical properties, and to work with non-equilibrium situations. Methods required to handle very large problems on parallel computers.

Prerequisite: PHY3355 (PHY3755), PHY3370 (PHY3770) and familiarity with FORTAN, Pascal or C.

Physics 74.504 (PHY5340)

**Computational Physics I**

Deterministic numerical methods in physics. Interpolation methods. Numerical solutions of Newton's, Maxwell's and Schrodinger's equations. Molecular dynamics. Non-linear dynamics. Numerical solutions of partial differential equations in physics. Finite elements. *This course cannot be combined for credit with PHY4340 (PHY4740).*

Physics 74.505 (PHY 5341)

**Computational Physics II**

Interpolation, regression and modeling. Random number generation. Monte Carlo methods. Simulations in thermo-statistics. Fractals, percolation, cellular automation. Stochastic methods. *This course cannot be combined for credit with PHY4341 (PHY4741).*

Physics 74.506 (PHY 5362)

**Computational Methods in Material Sciences**

Introduction to modern computational techniques used in material science research. Classical molecular dynamics, classical and quantum Monte Carlo methods, plane-wave based electronic band structure calculations, Car-Parrinello quantum molecular dynamics. Applications to condensed matter systems: basic simulation techniques, force-field based methods, first-principles quantum mechanical methods.

Prerequisite: Permission of the Department.

Physics 74.512 (PHY5361)

**Nonlinear Dynamics in the Natural Sciences**

Differential and difference equations, Fourier series and data analysis, stability analysis, Poincaré maps, local bifurcations, routes to chaos and statistical properties of strange attractors. Applications of these concepts to specific problems in condensed matter physics, molecular physics, fluid mechanics, dissipative structures, and evolutionary systems.

Prerequisite: Permission of the Department.

Physics 74.541F1 (PHY5100)

**Solid State Physics I**

Periodic structures, Lattice waves. Electron states. Static properties of solids. Electron-electron interaction. Dynamics of electrons. Transport properties. Optical properties.

Prerequisite: Permission of the Department.

Physics 74.542 (PHY5110)

**Solid State Physics II**

Elements of group theory. Band structure, tight binding and other approximations, Hartree-Fock theory. Describing the Fermi surface. Boltzmann equation and semiconductors. Diamagnetism, paramagnetism and magnetic ordering. Superconductivity.

Prerequisite: Permission of the Department.

Physics 74.543 (PHY5151)

**Type I and II Superconductors**

Flux flow and flux cutting phenomena. Clem general critical state model. Flux quantization, Abrikosov vortex model and Ginzburg-Landau theory. Superconducting tunnelling junctions (Giaever and Josephson types).

Prerequisite: PHY4370 and permission of the Department.

Physics 74.544 (PHY6371)

### Topics in Mössbauer Spectroscopy

Recoilless emission/absorption, anisotropic Debye-Waller factors, second order Doppler shifts. . Mössbauer lineshape theory with static and dynamic hyperfine interactions. Distributions of static hyperfine parameters. Physics of the hyperfine parameters: origin of the hyperfine field, calculations of electric field gradients.. Applications of Mössbauer spectroscopy.

Prerequisite: Permission of the Department.

Physics 74.547 (PHY5380)

### Semiconductor Physics I

Brillouin zones and band theory. E-k diagram, effective mass tensors, etc. Electrical properties of semiconductors. Conduction, hall effect, magneto-resistance. Scattering processes. Multivalley models and non-parabolic bands. Prerequisite: PHY4380 and permission of the Department.

Physics 74.548 (PHY5381/PHY5781)

### Semiconductor Physics II: Optical Properties

Optical constants and dispersion theory. Optical absorption, reflection and band structure. Absorption at band edge and excitons. Lattice, defect and free carrier absorption, Magneto-optics. Photo-electronic properties, luminescence, detector theory. Experimental methods.

Prerequisite: PHY4380 and permission of the Department.

Physics 74.549 (PHY5951)

### Low Temperature Physics II

Helium 3 and Helium 4 cryostats. Dilution refrigerators. Theory and techniques of adiabatic demagnetization. Thermometry at low temperatures. Problems of thermal equilibrium and of thermal isolation. Properties of matter at very low temperature.

Prerequisite: PHY4355 and permission of the Department.

Physics 74.551 (PHY5125)

### Charged Particle Dynamics

A course on the acceleration, transport and focusing of charged particles in vacuum using electric magnetic fields. Beam optics. Phase space of an assembly of particles. Applications to experimental systems.

Prerequisite: Permission of the Department.

Physics 74.552 (PHY5740)

### Physique Numérique I

Méthodes numériques déterministes en physique. Techniques d'interpolation. Solutions numérique des équations de Newton, de Maxwell et de Schrödinger. Dynamique moléculaire. Dynamique non-linéaire. Solutions numériques des équations aux dérivées partielles en physique. Éléments finis.

Prerequisite: Permission of the Department.

Physics 74.553 (PHY 5741)

### Physique Numérique II

Interpolation, régression et modeler. Nombres aléatoires. Techniques de Monte-Carlo. Simulations thermo-statistiques. Percolation, fractales, et automatisation cellulaire. Méthodes numériques stochastiques

Prerequisite: Permission of the Department.

Physics 74.554 (PHY5387)

### Physics of Materials

Microscopic characteristics related to the physical properties of materials. Materials families: metals and alloys, ceramics, polymers and plastics, composites, layered materials, ionic solids, molecular solids, etc. Specific materials groups. Equilibrium phase diagrams and their relation to microstructure and kinetics. Experimental methods of characterization. Interactions and reactions.

Prerequisite: PHY4382 or equivalent. Cannot be combined with PHY4387.

Physics 74.555 (PHY5355)

### Statistical Mechanics

Ensemble Theory. Interacting classical and quantum systems. Phase transitions and critical phenomena. Fluctuations and linear response theory. Kinetic equations.

Prerequisites: PHY4370 and PHY3355 and permission of the Department.

Physics 74.556 (PHY5742)

### Simulations Numériques en Physique

Un cours ayant but d'étudier des méthodes numériques avancées employées dans les problèmes à grande échelle dans les sciences naturelles. Emploi d'ensembles thermodynamiques différents, calculs de propriétés physiques expérimentalement pertinentes, et extension aux situations hors d'équilibre. Techniques pour ordinateurs parallèles.

Prerequisite: Permission of the Department.

Physics 74.557 (PHY5922)

### Advanced Magnetism

Study of some of the experimental and theoretical aspects of magnetic phenomena found in ferro-, ferri-, antiferro-magnetic and spin glass materials. Topics of current interest in magnetism.

Prerequisite: PHY4385 and permission of the Department.

Physics 74.558 (PHY5320)

### Introduction to the Physics of Macromolecules

The chemistry of macromolecules and polymers; random walks and the static properties of polymers; experimental methods; the Rouse model and single chain dynamics; polymer melts and viscoelasticity; the Flory-Huggins theory; the reptation theory; computer simulation algorithms; biopolymers and copolymers.

Prerequisite: Permission of the Department.

Physics 74.559 (PHY5347)

**Physics, Chemistry and Characterization of Mineral Systems**

The materials science of mineral systems such as the network and layered silicates. In-depth study of the relations between mineralogically relevant variables such as: atomic structure, crystal chemistry, site populations, valence state populations, crystallization conditions. Interpretation and basic understanding of characterization tools.

Prerequisite: Permission of the Department.

Physics 74.563 (PHY5310)

**Ion Collisions in Solids**

Energy loss of energetic particles in passing through solids. Stopping cross sections. The influence of crystal lattice on nuclear stopping. Crystal lattice effects at high energies. Channelling and blocking. The collision cascade. Charge states of fast ions in solids from thin foil and X-ray measurements.

Physics 74.573 (PHY6170)

**Advanced Quantum Mechanics II**

Systems of identical particles and many-body theory. Lattice and impurity scattering. Quantum processes in a magnetic field. Radiative and non-radiative transitions. Introduction to relativistic quantum mechanics.

Prerequisite: PHY5170 and permission of the Department.

Physics 74.646 (PHY6382)

**Physics of Semiconductor Superlattices**

Fundamental physics of two-dimensional quantized semiconductor structures. Electronic and optical properties of superlattices and quantum wells. Optical and electronic applications. This course is intended for students registered for the Ph.D. in semiconductor physics research.

Prerequisite: Advanced undergraduate or graduate course in solid state physics and permission of the Department.

Physics 74.647 (PHY6782)

**Physique des super-réseaux à semiconducteurs**

Physique fondamentale des structures quantiques bi-dimensionnelles à semiconducteurs. Propriétés électroniques et optiques des super-réseaux et puits quantiques. Applications à l'électronique et à l'optique. Ce cours est destiné aux étudiants et aux étudiantes inscrits au doctorat en physique des semiconducteurs.

Prerequisite: Permission of the Department.

# Political Economy

Loeb Building A818  
Telephone: 520-7414  
Fax: 520-2154

## The Institute

**Director of the Institute,** Rianne Mahon

The Institute of Political Economy, established in 1989, developed out of the Graduate Summer School of Political Economy, which was formed in 1983. The summer school was built on the strong tradition of interdisciplinary studies at Carleton, and on the interests of numerous faculty at Carleton involved in political economy. Distinguished international scholars have been attracted to teach in the summer school. Through the Institute, these distinguished visitors will now be in residence during the normal academic year, in addition to the summer program.

The Institute offers a program of study and research leading to the degree of Master of Arts in Political Economy, the only program of its kind in Canada. Its interdisciplinary program is designed to offer students both an exposure to the core concepts of political economy and an opportunity to develop individual areas of research concentration.

The program focuses on investigating the relationship between the economy and politics as they affect the social and cultural life of societies, and secondly, focuses on the historical processes whereby social change is located in the interaction of the economic, political, cultural, and ideological moments of social life.

Carleton University has developed a strong tradition in political economy. Faculty members from most of the social sciences and history participate regularly in the Institute. The program's curriculum includes courses with a political economy orientation that are offered by other departments, schools, and institutes. The Master of Arts in Political Economy is an opportunity for students to study political economy from the perspective of different disciplines within a single program.

## Qualifying-Year Program

Applicants who have a general (3 year) bachelor's degree in one of the disciplines represented in the program may be admitted to a qualifying-year program designed to raise their status to that of honours graduates. Students are expected to achieve at least high honours in qualifying-year courses in order to be considered for admission to the master's program. To be eligible for admission to a qualifying year, normally a student must previously have successfully completed at least four courses in one of the social sciences.

Refer to the General Regulations section of the Calendar for details of the regulations governing qualifying year.

## Master of Arts

### Admission Requirements

The normal requirement for admission to the master's program is B.A.(Honours), with at least high honours standing, in one of the disciplines represented in the Institute. Prospective applicants without such qualifications may be considered for admission if they have both a strong academic record and relevant work experience. Such students normally are asked to complete a qualifying year of study with at least high honours standing before proceeding to the master's program.

### Program Requirements

The Master of Arts in Political Economy is a 5.0 credit program, one of which may be at the 400- (honours undergraduate) level. Each candidate, in consultation with the Institute, must select and follow one of two optional patterns:

- \* 3.0 credits, a thesis equivalent to 2.0 credits, and an oral examination of the thesis
- \* 4.0 credits, a research essay equivalent to 1.0 credit, and an oral examination of the research essay

Whichever pattern is selected, all students in the Institute are required to take Political Economy 44.500 and 44.501, two 0.5 credit seminars offered by the Institute.

As well, students must select at least one course from the areas of International, Comparative or Canadian Political Economy, such as Sociology 53.525, Political Science 47.509, 47.557, 47.559, 47.588 or International Affairs 46.588, or approved equivalents of these courses. Registration in these courses is contingent upon the completion of all prerequisites or, in exceptional cases, obtaining the permission of the relevant department or school.

### Academic Standing

All master's candidates must maintain *B* standing or better (GPA of 8.0). A candidate may, with the recommendation of the Institute and the approval of the Dean of the Faculty of Graduate Studies and Research, be allowed a grade of C+ in 1.0 credit.

### Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

The Institute's courses will not normally be open to undergraduate students.

Political Economy 44.500F1,W1,S1

**Theories of Political Economy**

A survey of the core concepts and ideas proposed by both the founders and modern practitioners of political economy. Particular attention will be paid to contemporary theorists as well as classical theorists such as Smith, Ricardo, Marx, Mill, Schumpeter, Keynes, Veblen, and Innis.

Political Economy 44.501F1,W1,S1

**The Methodology of Political Economy**

An examination of the methods, procedures, and rules for developing theory and guiding inquiry in political economy research, including topics such as logic of inquiry, conceptualization, research design, dialectics, level of analysis, comparison, evidence and statistics.

Political Economy 44.551F1,W1,S1

**Selected Problems in Political Economy I**

(Also listed as Sociology 53.554 and Political Science 47.551)

Political Economy 44.552F1,W1,S1

**Selected Problems in Political Economy II**

(Also listed as Sociology 53.555 and Political Science 47.552)

Political Economy 44.590F1,W1,S1

**Tutorial in Political Economy**

A course of directed readings on selected aspects of political economy, involving preparation of papers as the basis for discussion with the tutor. Offered when no regular course of offering meets a candidate's specific needs. Prerequisite: Permission of the Director.

Political Economy 44.598F2,W2,S2

**Research Essay**

Directly linked to the student's course work, the research essay must be interdisciplinary in approach.

Political Economy 44.599F4,W4,S4

**M.A. Thesis**

The thesis is an alternative to the research essay. It must also be interdisciplinary in approach, and requires greater substance and originality than the Research Essay. Normally, a student's thesis committee will be composed of members from more than one discipline.

**Selection of Courses**

In addition to the graduate courses offered by, or associated with, the Institute, the courses listed below are of relevance to students of

political economy and would, with the prior approval of the Institute, be used to design a coherent and internally complementary set of courses to fulfill degree requirements. The list is not exclusive and is subject to change. Moreover, students may select 1.0 credit in political economy that is offered at the 400-level.

**Note:** Students should be aware that the number of spaces in graduate courses offered by other departments may be limited, and that registration may be conditional upon obtaining the prior approval of the department concerned. It is the student's responsibility to ensure that permission is obtained from the appropriate department prior to registering in any of the following courses.

The Institute expects to attract high quality graduate students who will be likely to continue to a second post-graduate degree. Given that a Ph.D. program in political economy does not exist, master's students will be directed to consult with the department where they might wish to pursue doctoral studies so that they may select courses that will prepare them for this next stage.

*Business*

42.530, 42.531

*Canadian Studies*

12.510, 12.520, 12.530

*Economics*

43.511, 43.521, 43.533, 43.538, 43.541, 43.542, 43.543, 43.544, 43.550, 43.554, 43.555, 43.586, 43.587

*Geography*

45.427 Urban Development and Analysis

45.520, 45.540, 45.541, 45.544

*History*

24.421 Science and Technology in the Canadian Experience

24.422 The Maritimes in Transition, 1870s to 1920s

24.431 Canada from Confederation to the Great War

24.433 Selected Problems in Canadian Business History 1850-1980

24.437 Canada from War to War

24.439 Modern Canada since 1939

24.459 Selected Problems in Nineteenth- and Twentieth-Century British Social History

24.459 Selected Problems in the History of Women and the Family: from the Industrial Revolution

24.471 Selected Problems in International Economic History

24.525, 24.530, 24.532, 24.534, 24.536,  
24.537, 24.558, 24.559

*International Affairs*

46.561, 46.564, 46.567, 46.580, 46.582

*Law*

51.401 ★ Law, Family and Gender

51.402 ★ Feminist Theories of Law

51.403 ★ Historical Perspectives on Law,  
Economy and Society

51.502, 51.503, 51.504, 51.505, 51.506,  
51.507, 51.520, 51.532

*Political Science*

47.400 Topics in Canadian Government and  
Politics

47.409 ★ Quebec Politics

47.412 ★ Politics of Western Liberal Democ-  
racies

47.413 ★ The State in Advanced Capitalist  
Societies

47.414 ★ Theory and Practice in Third World  
Development

47.415 ★ Selected Problems in Third World  
Development

47.431 ★ Marxist Thought

47.432 ★ Contemporary Marxism

47.441 ★ Business-Government Relations in  
Canada

47.463 ★ Analysis of International Political  
Economy

47.464 ★ Selected Problems in International Po-  
litical Economy

47.503, 47.508, 47.511, 47.517, 47.522,  
47.551, 47.552, 47.557, 47.559

*Public Administration*

50.502, 50.517, 50.519, 50.520, 50.536,  
50.537, 50.562, 50.567, 50.568, 50.570,  
50.572, 50.573

*Sociology and Anthropology*

53.500, 53.502, 53.507, 53.509, 53.511,  
53.519, 53.522, 53.525, 53.527, 53.529,  
53.530, 53.531, 53.532, 53.538, 53.540,  
53.544, 53.545, 53.554, 53.555, 53.567,  
53.568, 53.584

## Political Science

Loeb Building B640  
Telephone: 520-2777  
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Email: political\_science@carleton.ca

### The Department

**Chair of the Department,** Glen Williams

**Associate Chair,** To be announced

**Departmental Supervisor of Graduate Studies,** Chris Brown

**Assistant Supervisor of Graduate Studies,** H. von Riekhoff

The Department offers programs leading to the M.A. and Ph.D. degrees. Graduate study and research may be undertaken in the fields of political theory, Canadian government and politics, comparative government and politics, international relations, and public administration and policy analysis. Within these fields, students may select more specialized areas, such as classical, medieval, and modern, or analytic and empirical theory; comparative government and politics of a particular area or group of countries where the Department has developed particular strength.

In the Department and the self-standing schools and institutes, Carleton University houses one of the three largest concentrations in Canada of well-known political science professionals. In this configuration, the Department is unique in offering the full range of fields that make up modern political science, and is thus well placed to develop critical and analytical skills in its degree candidates, as the range of perspectives, priorities, and methodologies in contemporary political theory and political studies in general are brought into close relation with one another.

The Department is committed to the view that the goal of studying politics is to continue and further the search for the meaning and the morality of public life (community) by historical, critical, empirical, and analytical means. A community's politics and its public policy describe the extent of political community that is aspired to, and which can feasibly be accomplished given the context of power relations in the international and domestic institutional and economic conjunctures. The Department exists to continue the discussions that run through the history of the study of politics about what is good, and how to maintain the autonomy of the sphere of the public and the political in the face of multiple challenges, which now include citizen apathy and economic forces that escape states. Students emerge with minds

trained to identify, weigh, and sift ideals and evidence, using the full range of methodologies, and also with a grounding in the politics of areas and institutional configurations. They are also equipped for one of the most important roles in human life: that of citizen.

### Qualifying-Year Program

Applicants who have a general (3-year) B.A. in Political Science, with second-class standing, may be considered for admission to a qualifying-year program. Candidates who complete the qualifying year with high honours standing may be considered for admission to the master's program the following year.

Refer to the General Regulations section of this Calendar for details of the regulations governing the qualifying year.

### Master of Arts

#### Admission Requirements

The normal requirement for admission to the master's program is B.A.(Honours) (or the equivalent) in Political Science, with at least high honours standing.

Honours graduates in fields other than political science will be considered on the basis of their academic background and standing, and will be judged on a case-by-case basis. Those with only minor deficiencies may be required to take certain specified courses, while others whose degrees are less closely related to political science may be required to register in the qualifying year, at the discretion of the Department. Graduates of three-year programs in political science will be required either to complete the fourth year of an honours degree and reapply, or register in the qualifying year of the M.A. (see above), depending on work completed to date and academic standing.

#### Program Requirements

All master's candidates will fulfill a 5.0 credit program requiring departmental approval. No more than 1.0 credit may be taken at the 400-level. It is anticipated that candidates will enter with both political theory and research methods in their backgrounds. In cases where this is not so, candidates will, with the advice of the Department, select suitable courses as part of their programs.

All candidates, in consultation with the Department, will pursue their degree either by course work only or by undertaking an independent research project. The independent research project can be fulfilled in one of two ways: a 1.0 credit research paper on a topic related to at least one of the courses taken,

that may represent a significant development of one or more papers submitted in fulfillment of course requirements; or a 2.0 credit thesis.

Details of defences for the above M.A. options are outlined in the section on defences.

Students who choose to specialize in Canadian government and politics must demonstrate a reading knowledge of French, except where a degree of proficiency in another language makes more sense in relation to the student's program of studies.

Students whose mother tongue is other than English and who do not intend to specialize in Canadian politics, or students whose research interests require another language or another research skill such as methods, may obtain permission from the Department to substitute another language or a research skill for French. Departmental language tests are administered twice a year.

The language requirement may also be satisfied by passing an approved language course with a grade of B- or better.

## Course Requirements

All master's candidates are required to take an approved methods course. Students who have not already taken a course in research design and methods at the undergraduate level may be required, depending on the course pattern chosen, to take Political Science 47.570. When appropriate and related significantly to the program of study, another methods course, such as Political Science 47.534, 47.571, 47.572, or 47.573, may be substituted.

Candidates will follow one of three program patterns:

- \* 5.0 credits in approved courses
- \* Research Essay (1.0 credit) and 4.0 credits in courses
- \* Thesis (2.0 credits) and 3.0 credits in courses

Students following one of the M.A. study themes will follow one of two program patterns:

- \* 5.0 credits in approved courses
- \* Research Essay (1.0 credit) and 4.0 credits in courses

All students will receive faculty assistance in building their programs. General M.A. students will compose their own programs with the assistance of their faculty adviser and the graduate supervisor. Students pursuing a thematic option will choose a number of courses from among those listed annually, posted by June each year. Students following themes of study

will receive approval for their plans of study from the faculty coordinator for that theme and the graduate supervisor.

Master's students are asked to note that the Department has considerable strength in Canadian government and politics. Students opting to concentrate on Canada will be given assistance to develop their own program of study in this area.

## Study Themes

The Department draws to the attention of students the possibility of pursuing planned themes or special topics of study that draw systematically from the department's range of courses and expertise across two or more of the traditional fields of political science, and also opens the possibility of pursuing, depending upon prerequisites and with the permission of the academic units concerned, planned streams of course work across other departments, schools, and institutes of the University.

Themes include:

- \* Public affairs and policy analysis, with emphasis on quantitative analysis of public opinion, media impacts on policy, and on policy outcomes
- \* A political theory concentration that focuses on contemporary problems of modernity including the challenge that technology presents to the state
- \* North American community studies, with an emphasis on political institutions and how trade instruments affect domestic and regional politics
- \* European politics, which treats political integration and transitions in both western and eastern Europe
- \* Global politics and society
- \* Critical and analytical approaches to development in regard to selected geographical areas
- \* Government and institutions, at whose centre is an exploration of the role of the state and the importance of institutional provisions

Students pursuing a thematic option are required to meet the general program requirements for the M.A. degree. The course requirements that characterize each theme of study are listed below following the general theme description. The balance between core and optional courses differs across themes. In all cases where courses are taken outside the Department, students must have the prerequisites or obtain permission of the instructor of the course in question.

### **Public Affairs and Policy Analysis**

This theme of study focuses on theoretical and practical analysis of the policy process, including the design, management, communication, and analysis of all aspects of policy, with particular emphasis on quantitative analysis of public opinion, media impacts on policy, and policy outcomes.

Students must normally complete a total of 5.0 credits consisting of:

- \* Approved methods course(s)
- \* Political Science 47.647
- \* Political Science 47.648
- \* Research Essay (1.0 credit) on a topic appropriate to the theme; and/or
- \* Approved course options

### **Political Theory: Modernity, Technology, and the Common Good**

This theme explores ethical and analytical concepts for the evaluation of contemporary political practice, including legitimacy, civic virtue, and human rights. Its central topics include the critique of modernity; global technology; the communitarian-liberalism debate; alternative understandings of the common good; and the competing claims of charity and justice. Its approaches include hermeneutics, phenomenology, postmodernism, critical theory, democratic theory, and political culture and myth.

Students must normally complete a total of 5.0 credits consisting of:

- \* Approved methods course(s)
- \* Political Science 47.630 and 47.631
- \* At least 1.0 credit from a list of courses approved annually for the core
- \* Research Essay (1.0 credit) on a topic appropriate to the theme; and/or
- \* Approved course options

### **North American Government and Community Studies**

This theme of study focuses on the politics of the North American region. Students will explore the forces linking Canada, the United States and Mexico from a variety of perspectives, including institutions, political economy, the domestic politics of the players and the international relations within the zone.

American political community from a variety of perspectives, including structures, political economy, the domestic politics of the players, and the international relations within the zone.

Students must normally complete a total of 5.0 credits consisting of:

- \* Approved methods course(s)

\* At least 1.0 credit from a list of courses approved annually for the core

\* Research Essay (1.0 credit) on a topic appropriate to the theme; and/or

\* Approved course options

### **European Politics**

The theme focuses on the contemporary transitions of European politics, encompassing political integration through the European Union and the transition from communism in Eastern Europe, Central Europe, and Russia.

These changes have called into question conventional thinking about market reform, democratization, and the role of the state. Because these shifts and transformations have created an environment in which European political issues have become both more continental in scope and more comparable, students opting for this scheme can pursue a course of study encompassing both Western and Eastern Europe.

Students must normally complete a total of 5.0 credits consisting of:

- \* Approved methods course(s)
- \* At least 1.5 credits from a list of courses approved annually for the core
- \* Research Essay (1.0 credit) on a topic appropriate to the theme; and/or
- \* Approved course options

### **Development Politics**

This theme features topical, critical, and analytical approaches to development. Students will explore the political economy of development and underdevelopment, democratization and the elaboration of "civil society", the politics of aid-giving and receiving, and the role of non-governmental organizations. Approved options include courses that focus on regions, including Africa, Latin America, and the post-communist countries, as well as Canada.

Students must normally complete a total of 5.0 credits consisting of:

- \* Approved methods course(a)
  - \* At least 1.5 credits from a list of courses approved annually for the core
  - \* Research Essay (1.0 credit) on a topic appropriate to the theme;
- and/or

\* Approved course options in area or regional studies

### **Global Politics and Society**

This theme focuses on two related themes: the politics of global society, and Canada and the world. Students will explore the ways in which the process of globalization, conceived as the

compression of the world and the intensification of consciousness of the world as a whole, accelerated by the political and economic collapse of the communist bloc and the integration of its successor states into the world economy, has altered the international economic and political orders. The second theme, Canada and the world, is designed to enable students to explore the implications of this globalization process for the future of Canada.

Students must normally complete a total of 5.0 credits consisting of:

- \* Approved methods course(s)
  - \* At least 1.5 credits from a list of courses approved annually for the core
  - \* Research Essay (1.0 credit) on a topic appropriate to the theme;
- and/or
- \* Approved course options

### **Government and Institutions**

The "government" theme of study is concentrated upon state institutions, taking up recent debates about the effectiveness of various kinds of regimes and institutional and rule structures, the role that such structures play in promoting or resisting change, and the changes in the reach and autonomy of politics and the state itself amid fiscal crises and other challenges. Within the theme, students can choose to centre their options on Canada, or they may pursue comparative (area, regional) studies.

Students must normally complete a total of 5.0 credits consisting of:

- \* Approved methods course(s)
  - \* At least 1.0 credit on state institutions, governance, and the issue of how much room is left for politics in different economic environments, from among courses approved annually for the core
  - \* At least 1.0 credit drawn from a list of courses approved annually whose emphasis is on regime types and the configuration of representative institutions, including the place of bureaucracy, and organizations
  - \* Research Essay (1.0 credit) on a topic appropriate to the theme;
- and/or
- \* Approved course options

### **Defences**

In the case of the student choosing a research essay, that essay will be evaluated by two of the Department's faculty members including the supervisor and a second reader, and a letter grade will be assigned. An oral defence

of the essay is not required but may be requested by the supervisor or second reader.

In the case of the student choosing a thesis, the thesis will be evaluated by three people: the student's thesis supervisor from the Department, a second reader from the Department, and an external third reader who is generally from another Carleton Department but may sometimes come from outside the University. A thesis must be defended orally before the three evaluators. No letter grade is assigned, but notations of *Pass with Distinction*, *Satisfactory*, and *Unsatisfactory* are assigned.

### **Academic Standing**

All master's candidates must obtain a *B* standing or better (GPA 8.0). One grade of *C+* may be allowed.

### **Internship Program**

Internship placements may be available to persons eligible to work in Canada who are full-time students and are registered in the Internship Program option of the master's program. The Internship Program is an option within the five-course, research essay, or thesis M.A. program patterns. Placements locate students for one term in government departments or non-governmental organizations and integrate the theoretical and practical aspects of Graduate Studies in Political Science. A placement is combined with registration in 47.592★, Internship Placement. This course is required for students who graduate from this option.

### **Doctor of Philosophy**

The Ph.D. program in political science normally will be undertaken on a full-time basis. However, in cases of exceptional merit, the Department will accept a few candidates for the degree on a part-time basis.

### **Admission Requirements**

The normal requirement for admission to the Ph.D. program is a master's degree (or its equivalent) in political science with high honours standing or better. Applicants should note, however, that meeting the admission requirement does not guarantee admission to the program. Review of the department's competitive selection process indicates that students with a GPA below 10.0 (A-) in the master's program are generally not recommended for admission to the doctoral program. Students applying on the basis of a master's degree from other disciplines will be considered on a case-by-case basis, and may be required to take additional courses as part of the program.

## Program Requirements

The normal program requirements for Ph.D. candidates are outlined in the General Regulations section of this Calendar.

It is anticipated that Ph.D. candidates will enter with a background in political theory at the undergraduate level, regardless of their desired field of specialization. Those who do not will be treated as special cases and will have their programs arranged accordingly. If statistical proficiency is needed for the preparation of the thesis, students will also be expected to take a course in research methods. Candidates are also expected to demonstrate proficiency in a second language or in research methods. All candidates will complete 47.696.

The program requirements (10.0 credits unless additional course work is required) for Ph.D. candidates in Political Science are the following:

- \* At least 1.0 credit at the graduate level in each of the candidate's two major fields of study; a GPA of 9.0 or better must be obtained in these courses for students to be allowed to proceed to the comprehensive examinations.

- \* Satisfactory completion of Political Science 47.690 (1.0 credit), preparation for a written comprehensive examination covering the two major fields. The grade to be awarded will be that obtained on the field examinations, normally written in two parts with one week between the parts, on two occasions each year, April and August.

- \* Proficiency in a research skill, as outlined under research skill requirement

- \* At least 1.0 credit will normally be taken during the second year of the program in fields allied to the major topics of the thesis. This credit will normally be fulfilled through regular course work rather than tutorials.

- \* Successful completion of Political Science 47.696 (1.0 credit)

- \* A public defence, in English, of a written thesis proposal

- \* A 5.0 credit thesis, written in English or French, which will be defended in English at an oral examination.

Full-time students are required to complete the comprehensive examinations within 12 months of entering the program, and must normally complete the public defence of the thesis proposal, preceded by its formal acceptance by the supervisory committee, within 24 months of entering the doctoral program.

Ph.D. candidates will each be assigned a faculty member to advise them on their studies. Students' programs, including the choice of supervisor and the thesis committee, must be

approved by the Department. The thesis supervisor will normally be chosen from among faculty members in the Department of Political Science. Upon approval of the thesis supervisor and the Department, committee members may be chosen from elsewhere within the University.

## Research Skill Requirement

Ph.D. candidates must demonstrate the ability to use a research skill appropriate to their program. The research skill requirement will normally be satisfied before the defence of the thesis proposal, and will take one of the following forms:

- \* An ability to read and translate French or another language appropriate to their course of study; or the ability to speak a language other than English sufficient to conduct interviews in that language

- \* Credit work in an approved political science methods course, workshop, or colloquium, equivalent to 1.0 credit; or any two of the following courses (or an approved alternative): Political Science 47.570, 47.571, 47.572, and 47.573.

## Comprehensive Examinations

All Ph.D. candidates must successfully complete a written comprehensive examination covering their two major fields. The examination is in the form of two examination papers normally written one week apart. At the discretion of the Department, candidates may be required to take an oral examination following the written examination.

The fields of study for the Ph.D. comprehensive examination are to be chosen from the following list:

### *Political Theory*

A general knowledge of the main outlines and significant themes and problems of political philosophy and thought.

### *Canadian Government and Politics*

A general knowledge of Canadian political ideas, institutions, and processes.

### *Comparative Government and Politics*

A general knowledge of the theories and methodology of comparative politics.

### *International Relations*

A general knowledge of international relations theory and the development of the field, including international organization, global political economy, conflict resolution, strategic studies, foreign policy analysis, international development, and gender and international relations.

*Public Affairs and Policy Analysis*

A general knowledge of theories of bureaucracy, organization, and public administration; and theory, practice, and methods of analysis in public affairs and public policy within and outside Canada.

**Thesis Proposal**

All students must publicly defend a thesis proposal after completing their comprehensive examinations. Full-time students must complete this requirement within the first two years of registration in the program. Details on this program requirement are provided in *Departmental Guidelines for the Graduate Program*.

**Selection of Courses**

Within the scope of the regulations, the following undergraduate courses (fully described in the *Undergraduate Calendar*) may be taken by graduate students.

Please note that not all of these courses are offered every year. Students should consult the timetable published each year in early June.

*Political Science*

47.400 Topics in Canadian Government and Politics

47.402 Policy Seminar: Problems of Northern Development

47.403 Politics and the Media

47.405 Stability, Justice and Federalism

47.407 The Politics of Law Enforcement in Canada

47.408 National Security and Intelligence in the Modern State

47.409 Quebec Politics

47.410 Canadian and Comparative Local Government and Politics

47.411 French-English Relations

47.412 Politics of Western Liberal Democracies

47.413 The Modern State

47.414 Theory and Practice in Third World Development

47.415 Selected Problems in Third World Development

47.416 Labour and the Canadian State

47.417 Political Participation in Canada

47.418 Canadian Provincial Government and Politics

47.419 The Politics of the Canadian Charter of Rights and Freedoms

47.420 Policy Making in the United States

47.421 Politics of Influence in the United States

47.422 Comparative Constitutional Politics

47.425 Identity Politics

47.431 Marxist Thought

47.432 Contemporary Marxism

47.434 Political Inquiry

47.435 Contemporary Political Theory

47.441 Business-Government Relations in Canada

47.449 Issues in Development Management

47.450 Feminist Political Analysis in Comparative Perspective

47.455 Transitions to Democracy

47.460 Analysis of International Politics

47.461 Foreign Policies of Soviet Successor States

47.462 Bargaining and Negotiation

47.463 Analysis of International Political Economy

47.464 Selected Problems in International Political Economy

47.465 Gender in International Relations

47.466 American Foreign Policy

47.467 International Politics of North America

47.482 International Politics of Africa

47.483 Foreign Policies of Major East Asian Powers

Students are encouraged to look for courses within Carleton in the Departments of Economics, Geography, History, Law, Philosophy, and Sociology and Anthropology; the Schools of Business, Journalism and Communication, Public Administration, and the Norman Paterson School of International Affairs; and in the Institutes of European and Russian Studies, and Political Economy. They are equally strongly encouraged to look for courses in the Departments of Political Science and Philosophy at the University of Ottawa.

All courses selected will be subject to the approval of the Department, on grounds of appropriateness to the program of study and the avoidance of excessive overlap between courses.

**Graduate Courses**

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please**

consult the *Registration Instructions and Class Schedule* booklet published in the summer.

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Enrolment in graduate courses requires the permission of the Department, through the supervisor of graduate studies.

Political Science 47.500F1 or W1

### **Topics in Canadian Government and Politics**

Depending on student demand and faculty interest, a seminar will be offered on the political challenges faced by citizens, politicians and governments in Canada.

Political 47.502F1 or W1

### **Political Law: Principles**

An examination of the legal framework of the state, and the various types of instruments of government. It treats the way law makes its impact upon decision-making, with a particular focus on the influence of law on policy, administrative action, and political life.

Political Science 47.503F1 or W1

### **Political Parties in Canada**

A seminar on political parties and party systems in Canadian federal politics, including an examination of patterns of historical development, party organization and finance, relationships with social movements, and the impact of Canadian federalism.

Political Science 47.506F1 or W1

### **Legislative Process in Canada**

The role of Parliament and of the individual M.P. in terms of policy making, representation and the passage of legislation. Also offered at the undergraduate level, with different requirements, as Political Science 47.406★, for which additional credit is precluded.

Political Science 47.507F1 or W1

### **Topics in Canadian Politics and Government in Comparative Perspective**

Depending on student demand and faculty interest, a seminar will be offered on topics in Canadian politics and government within a comparative perspective, the various countries being considered chosen on the basis of the issue at hand.

Political Science 47.508F1 or W1

### **The Politics of Energy and the Environment**

A research seminar focusing upon the substantive issues, the policy structures and processes, and current Canadian governmental response in the area of energy policy and environmental quality management.

Political Science 47.509F1 or W1

### **Canadian Political Economy**

A seminar on political economy as a traditional and contemporary approach to the study of Canadian politics and the Canadian state. Canada's economic development, social relations (including gender and race relations), and position in the international political economy is explored.

Political Science 47.510F1 or W1

### **Indigenous Politics of North America**

Examines issues of governance regarding the original peoples of Canada, Mexico and the United States before and since the European invasion, including: movement for restoration of cultural, socio-economic, political, land and self-government rights. Also offered at the undergraduate level, with different requirements, as Political Science 47.426, for which additional credit is precluded.

Political Science 47.511F1 or W1

### **Canadian Federalism**

A study of the evolution and contemporary operation of the Canadian federal system, noting particularly the specific social, political, economic, and structural features which underlie its operational performance, its resilience in crisis, and its potential for adaptation.

Political Science 47.514F1 or W1

### **The Transition from Communism**

An in-depth investigation of the problems of transition in post-communist societies.

Political Science 47.515F1 or W1

### **Post-Communist Politics in East Central Europe**

A comparative examination of the emergence of post-communist political systems in East Central Europe.

Political Science 47.516F1 or W1

### **Selected Problems in the Politics of Soviet Successor States**

A seminar on selected problems of nation-building in Russia, Ukraine, and other Soviet successor states.

Political Science 47.517F1 or W1

### **Globalization, Adjustment and Democracy in Africa**

This course will explore the nature of global pressures in Africa as states go through a "second wind" of political and economic change. Also offered at the undergraduate level, with different requirements, as Political Science 47.427, for which additional credit is precluded.

Political Science 47.518F1 or W1

### **State, Revolution and Reform**

The dynamics of political change and economic growth in non-Western states, emphasizing challenges to dominant patterns of policy-making with a view of exploring alternate modes of modernity.

Political Science 47.519F1 or W1

### **Comparative Public Policy**

A review of approaches to the study of policy, of the impact of political factors on policy, and of the substance of policy choices in such domestic fields as communications, social security, health, industrial and rural development policies in selected countries.

Political Science 47.520F1 or W1

### **Nationalism**

A seminar on the historical and comparative study of nationalism, with emphasis on its role in the promotion of political change.

Political Science 47.521F1 or W1

### **Politics in Plural Societies**

A seminar on politics in multicultural societies and multi-national states, including settler and post-colonial societies. Topics may include: conflict relating to race, religion, language, regionalism, intra-state nationalism, multicultural policies and theories of pluralism.

Political Science 47.522F1 or W1

### **Politics of Third World Development**

A seminar examining the politics of development and underdevelopment in the Third World. Topics covered include theory, selected issues, and case studies from Africa, Asia, and Latin America.

Political Science 47.523F1 or W1

### **Southern Africa in the Post-Apartheid Era**

This course will explore the pathology of apartheid, the reasons for its end, and prospects for democratization and development in southern Africa in the era of globalization. Also offered at the undergraduate level, with different requirements, as Political Science 47.423, for which additional credit is precluded.

Political Science 47.524F1 or W1

### **Elections**

The conduct and meaning of elections in contemporary states. Attention to the connection of elections to concepts of representation, policy mandates, and political parties, and to electoral systems and referenda. Also offered at the undergraduate level, with different requirements, as Political Science 47.424★, for which additional credit is precluded.

Political Science 47.525F1 or W1

### **Problems in American Government I**

A research seminar on topics such as the distribution of power, decision-making processes, the impact of technology, strains in intergovernmental relations, civil-military relations, governmental news management and secrecy; executive accountability, and impediments to reform of Congress and the presidency.

Political Science 47.526F1 or W1

### **Problems in American Government II**

A research seminar on topics such as political violence and social change, the roles of mass

media, business elite roles, political corruption, civil rights and minority politics, and the urban crisis.

Political Science 47.531F1 or W1

### **Modern Political Culture and Ideology**

This seminar explores certain connections among image, symbol, myth, language, and politics. Topics include the expressive and designative conceptions of language; myth, metaphor and the foundations of civic life; rhetoric and the sensus communis; romanticism and nationalism; myth in democratic and totalitarian politics; and the structure of political culture.

Political Science 47.532F1 or W1

### **Democratic Theories**

Analysis of various theories of democracy and community, from classical to modern.

Political Science 47.534F1 or W1

### **Political Inquiry**

This seminar focuses on the major approaches to research in political areas as discussed in contemporary philosophy of the social sciences, exploring the variety of explanatory strategies in use in the contemporary study of politics. Precludes additional credit for Political Science 47.570.

Political Science 47.536F1 or W1

### **North American Political Traditions**

A seminar on the interpretations that may include American, Mexican, anglo-Canadian and franco-Canadian political traditions.

Precludes additional credit for Political Science 47.535.

Political Science 47.537F1 or W1

### **Political Thought in North America**

Depending on student demand and faculty interest, a tutorial will be offered in topics related to the development of contemporary political thinking, including some more descriptive and contemporary topics such as the impact of religion and religiosity in political thought and culture.

Precludes additional credit for Political Science 47.535.

Political Science 47.538F1 or W1

### **Concepts of Political Community I**

A critical survey of concepts of political community, including the common good, justice, citizenship, statesmanship, democracy, and legitimacy, from ancient, modern, and contemporary political theory.

Precludes additional credit for Political Science 47.436.

Political Science 47.539F1 or W1

### **Concepts of Political Community II**

A continued critical survey of concepts of political community, including the common good, justice, citizenship, statesmanship, democracy,

and legitimacy, from ancient, modern, and contemporary political theory.  
Precludes additional credit for Political Science 47.437.

Prerequisite: Political Science 47.538 or permission of the Department.

Political Science 47.541F1 or W1

**Canadian Public Administration and Policy Analysis**

The theory and practice of public administration in Canada, with emphasis on the federal level, including the role of the bureaucracy in policy making.

Political Science 47.544F1 or W1

**Public Administration in Developed Western Countries**

A seminar in comparative public administration, with emphasis on Commonwealth countries, the United States, France, and West Germany.

Political Science 47.545F1 or W1

**Public Administration in Developing Countries**

A seminar on the literature and characteristics of development administration; comparison by region, country, and topic.

Political Science 47.546F1 or W1

**Topics in Public Affairs**

A seminar on selected topics in the role and impact of media, issues in public affairs and public policy.

Political Science 47.549F1 or W1

**Research Seminar in Public Administration**

The content of this seminar will vary from year to year according to faculty research interests and student demand.

Political Science 47.551S1

**Selected Issues in Political Economy I**

A research seminar exploring a selected topic of current research having a political economy perspective, such as power and stratification; dynamics of state action; contrasting views on administration as an instrument of political economy; culture, ideology, and social relations; and the labour process. (Also listed as Political Economy 44.551 and Sociology 53.544)

Political Science 47.552S1

**Selected Issues in Political Economy II**

A research seminar exploring a selected topic of current research having a political economy perspective, such as power and stratification; dynamics of state action; contrasting views on administration as an instrument of political economy; culture, ideology, and social relations; and the labour process. (Also listed as Political Economy 44.552 and Sociology 53.555)

Political Science 47.553F1 or W1

**Topics in West European Politics**

This course is designed to deal intensively with domestic politics in Britain, France, Germany, Italy, and selected minor European powers.  
Precludes additional credit for Political Science 47.550.

Political Science 47.554F1 or W1

**Topics in West European Politics**

This course is designed to deal intensively with comparative and supra-national issues concerning the European Community, NATO, and other Western European institutions.  
Precludes additional credit for Political Science 47.550.

Political Science 47.555F1 or W1

**Topics in Comparative Politics I**

A research seminar dealing with a central theme of current research in comparative politics, such as: the effects of state policy and expenditure; technology and politics; political psychology; sex/gender and politics; the military and politics; Marxism and politics; religion and politics; studies in revolution; comparative parties and interest groups.

Political Science 47.556F1 or W1

**Sex/Gender and Politics**

Examines selected sex/gender dimensions of politics in comparative perspective. Topics may include: gendered nature of authority, sex/gender regimes and state forms; feminist accounts of citizenship, representation, power and democracy; women's movements and anti-feminist movements; identity politics; gendered accounts of nationalism and multiculturalism.

Political Science 47.557F1 or W1

**Social Movements, Interests and the State**

This course examines major theoretical approaches to state-society relations in industrialized countries with particular attention to the role of social movements and organized interests. The theoretical approaches used to interpret and explain particular national outcomes include pluralism, neo-marxism, institutionalism, rational choice and post-modernism.

Political Science 47.559F1 or W1

**Governing in the Global Economy**

The course examines how national states respond to challenges of governing in an increasingly interdependent global economy. The course will be comparative in its focus, emphasizing advanced industrial societies primarily in western Europe and Canada.

Political Science 47.561F1 or W1

**Analysis of Canadian Foreign Policy**

A research seminar on contemporary Canadian external policies, with emphasis on the analysis of cases and issues, and comparisons with other national actors.

Political Science 47.567F1 or W1

### **International Politics of North America**

An examination of continentalism in Canadian foreign policy during the twentieth century that charts regional, economic, political, and defence relations in North America. Also offered at the undergraduate level, with different requirements, as Political Science 47.467, for which additional credit is precluded.

Political Science 47.570F1 or W1

### **Basic Research Methods**

A course in applied research design and methodology, with emphasis on empirical research strategies that are amenable to quantification. Master's students who have not completed Political Science 47.270 (or its equivalent) with high honours or better standing may be required to take this course.

Political Science 47.571F1 or W1

### **Intermediate Polimetrics for Micro Data**

This course covers intermediate research designs and statistical techniques primarily used in analyzing survey data. Selected topics may vary from year to year. Students intending to do research based on micro data are advised to take this course. Also offered at the undergraduate level, with different requirements, as Political Science 47.471, for which additional credit is precluded.

Prerequisite: Political Science 47.570 or permission of the Department.

Political Science 47.572F1 or W1

### **Intermediate Polimetrics for Macro Data**

This course covers intermediate research designs and statistical techniques primarily used in analyzing macro or aggregate data. Selected topics may vary from year to year. Students intending to do research based on macro data are advised to take this course. Also offered at the undergraduate level, with different requirements, as Political Science 47.472, for which additional credit is precluded.

Prerequisite: Political Science 47.570 or permission of the Department.

Political Science 47.573F1 or W1

### **Advanced Research Methods**

A course in advanced techniques of analysis. The focus of this research seminar is the use of various mathematical and statistical techniques in the construction and analysis of political theory. The seminar may include such topics as the translation of verbal theory into formal theory, the use of statistical techniques beyond regression and correlational analysis to examine political hypotheses, and index construction, including scaling and validation techniques.

Prerequisite: Political Science 47.570 or permission of the Department.

Political Science 47.581F1 or W1

### **Foreign Policies of African States**

The foreign policy determinants and international behaviour of African states. Each year, the seminar focuses on a particular issue area. Precludes additional credit for Political Science 47.582.

Prerequisite: Permission of the Department.

Political Science 47.584F1 or W1

### **International Relations of South and South-East Asia**

Foreign policy orientations of the regional actors and interaction with non-regional actors. Special emphasis on enduring sources of conflict within the area, and emerging patterns of co-operation, including comparison of ASEAN with SAARC. Also offered at the undergraduate level, with different requirements, as Political Science 47.484★, for which additional credit is precluded.

Political Science 47.585F1 or W1

### **Foreign Policy Analysis**

A research seminar dealing with selected problems in the study of foreign policy formulations and outcomes.

Political Science 47.586F1 or W1

### **Strategic Thought and Issues in International Security**

A research seminar on the evolution of classical and contemporary strategic thought, as well as on current issues in international security.

Political Science 47.587F1 or W1

### **Analysis of International Organizations**

A research seminar on process and change in contemporary forms of international organization.

Political Science 47.588F1 or W1

### **International Political Economy**

A seminar on the changing international division of labour, and its consequences for world politics. Topics include differing patterns of industrialization, colonial relations, the role of the state, and current issues in international political economy. (Also listed as International Affairs 46.588)

Prerequisite: Work at a senior undergraduate level in at least two of the following: international relations, development studies, international trade, or political economy; or permission of the Department.

Political Science 47.589F1 or W1

### **Problems in International Politics**

A workshop on significant issues in the study of international politics, with emphasis on the state of the field (and subfields) and problems in research.

Prerequisite: Political Science 47.560, or 47.660 and 47.661, or permission of the Department.

Political Science 47.590T2

**Tutorial in a Selected Field**

Tutorials or reading courses on selected topics may be arranged with the permission of the Department.

Political Science 47.591F1, W1, S1

**Tutorial in a Selected Field**

Tutorials or reading courses on selected topics may be arranged with the permission of the Department.

Political Science 47.592F1, W1, S1

**Internship Placement**

Internship placements are approved by the Supervisor of Graduate Studies. Academic requirements are met through an essay and oral examination.

Prerequisite: Selection to Internship Program.

Political Science 47.598F2, W2, S2

**M.A. Research Essay**

Tutorial for students who write a research essay rather than a thesis.

Political Science 47.599F4, W4, S4

**M.A. Thesis**

Please note that courses numbered 47.600 through 47.661 are open to both M.A. and Ph.D. students.

Political Science 47.600F1

**The Political Process in Canada I**

An analytical study of the democratic political process, with particular reference to political parties and elections, pressure groups, and political leadership in Canada.

Precludes additional credit for Political Science 47.510.

Political Science 47.601W1

**The Political Process in Canada II**

An analytical study of the democratic political process, with particular reference to political parties and elections, pressure groups, and political leadership in Canada.

Precludes additional credit for Political Science 47.510.

Political Science 47.615F1

**Comparative Politics I**

A research seminar dealing with theories, methods, and problems of comparison.

Precludes additional credit for Political Science 47.505.

Political Science 47.616W1

**Comparative Politics II**

A research seminar dealing with particular themes.

Precludes additional credit for Political Science 47.505.

Political Science 47.630F1

**Political Theory I**

An intensive examination of the major questions in classical, medieval, modern, and contemporary political philosophy. This political

theory course is both historically comprehensive in scope and thematically oriented in depth. Precludes additional credit for Political Science 47.530.

Political Science 47.631W1

**Political Theory II**

An intensive examination of the major questions in classical, medieval, modern, and contemporary political philosophy. This political theory course is both historically comprehensive in scope and thematically oriented in depth. Precludes additional credit for Political Science 47.530.

Political Science 47.647W1

**Public Policy: Content and Creation**

This course provides an opportunity to examine and apply major perspectives on the content and creation of public policy. The focus is on the explanation, prediction and design of policy. Perspectives and examples are drawn from a variety of frameworks and from both Canadian and non-Canadian contexts. Also offered at the undergraduate level, with different requirements, as Political Science 47.447, for which additional credit is precluded.

Political Science 47.648F1 or W1

**Public Affairs Management and Analysis**

A seminar on theories and practice in the management of public affairs, including the environment and administration of the public sector, public opinion, and public communications. Also offered at the undergraduate level, with different requirements, as Political Science 47.446★, for which additional credit is precluded.

Political Science 47.660F1

**Theory and Research in International Politics I**

An examination of the principal problems in contemporary international relations theory and research, emphasizing the state of the field and current directions in it.

Precludes additional credit for Political Science 47.560.

Political Science 47.661W1

**Theory and Research in International Politics II**

An examination of the principal problems in contemporary international relations theory and research, emphasizing the state of the field and current directions in it.

Precludes additional credit for Political Science 47.560.

Political Science 47.690F3, W3, S3

**Ph.D. Tutorials**

Ph.D. tutorials specifically designed as intensive preparation for the major field examinations, under the direction of one or more members of the Department. The grade to be awarded will be that obtained on the field examination.

Political Science 47.691F3, W3, S3

**Ph.D. Tutorials**

Ph.D. tutorials specifically designed as intensive preparation for the minor field examinations, under the direction of one or more members of the Department. The grade to be awarded will be that obtained on the field examinations.

Political Science 47.692F3, W3, S3

**Ph.D. Tutorials**

Ph.D. tutorials specifically designed as intensive preparation for the minor field examinations, under the direction of one or more members of the Department. The grade to be awarded will be that obtained on the field examinations.

Political Science 47.695F3, W3, S3

**Ph.D. Tutorials**

Ph.D. tutorials specifically designed as intensive preparation for the major field examinations, under the direction of one or more members of the Department. The grade to be awarded will be that obtained on the field examination.

Political Science 47.696T2

**Thesis Proposal Workshop**

Following a survey of general issues and problems in developing research proposals, students will prepare their own thesis proposal. Coordinated by one instructor, but faculty from other fields will also participate. The grade for this course will be *Satisfactory* or *Unsatisfactory*.

Prerequisite: Successful completion of comprehensive examinations or permission of the Department.

Political Science 47.699F10, W10, S10

**Ph.D. Thesis**

# Psychology

Loeb Building B552  
Telephone: 520-2644  
Fax: 520-3667

## The Department

**Chair of the Department, Kim Matheson**

**Departmental Supervisor of Graduate Studies, Lise Paquet**

The Department of Psychology offers programs of study and research on a full-time and part-time basis, leading to the degrees of M.A., M.Sc. and Ph.D. Financial support is available, but is limited to full-time students.

There is a very close link in the Department of Psychology between graduate studies and research. Research in the Department is distributed across the life sciences areas of behavioural neuroscience, animal learning, perception, and cognition, and across the social sciences areas of social and developmental psychology. Its research and graduate program in behavioural neuroscience is one of the strongest in Canada, with current research focusing on problems of the neurochemistry of stress and learning; developmental psychopharmacology; experimental models of epilepsy; neurodegeneration; dementia; neural mechanisms of audition; drug dependence; and the effects in animals and humans of prenatal alcohol and drug exposure on postnatal behaviour. The Department has related human neuropsychological research activities dealing with alterations to visual and auditory psychophysical functions associated with neuropathological conditions. In recent years, there has been a growth of activity in aspects of applied psychology, including evaluation research; corrections; education; impact of computer and telecommunications technology; behavioural medicine; and psychological assessment. This has fostered close collaborative contacts between the Department and public service and applied settings in Ottawa, such as the Children's Hospital of Eastern Ontario, the Royal Ottawa Hospital, the National Research Council, Department of Communications (Canada), Ontario Ministry of Correctional Services, and the Ottawa-Carleton Board of Education. Practica and internships are available in many of these settings to students at the doctoral level.

Because of the breadth of interests in the Department, there is an emphasis in graduate courses on methodological and conceptual issues that are applicable across research specializations. Consequently, most substantive courses, regardless of title, are relevant to most students' programs. Students typically work very closely with their advisers who, through informal tutorials and directed studies

and independent research courses, provide much of the opportunity for specialized study. Applicants are strongly encouraged to write directly to faculty members for more specific details on research interests and programs currently underway.

As part of its general experimental program, the Department provides the opportunity to pursue a concentration at the master's and doctoral level in, behavioural neuroscience (a collaborative specialization with the University of Ottawa), human neuropsychology, or human information systems. Applicants should consult with the supervisor of graduate studies for information on structuring a doctoral program of studies within a concentration.

Through a quantitative methods requirement, completion of a demanding empirical thesis presented and defended orally, participation in small seminars, and a close relationship with faculty advisers and students, the master's programs provides the opportunity for a refinement of critical, logical, and analytical skills; skills of written and oral expression; understanding of the strengths and limitations of the scientific method as a means of problem solving, demonstrated through psychology but applicable to issues in society at large; an understanding of quantification and scaling, the use of statistical methods and inference, and the use of evidence to support argument. For some students this is a satisfactory and satisfying end in itself. For others, it provides a solid preparation for the doctoral program in which original independent study and research is stressed. The Department does not distinguish between an applied and an experimental program; instead, the basic orientation is experimental and theoretical, but with opportunities, where appropriate, to provide complementary experience necessary to work successfully as a psychologist in applied research/service settings.

Augmenting the well-equipped laboratories expected in an active research environment, the Department of Psychology receives excellent technical support from the Carleton University Science Technology Centre, where design and manufacture of special-purpose apparatus is carried out. In addition, the workshops provide technical support for the more than twenty-five computer systems currently in use in laboratories throughout the Department.

In fulfilling degree credit requirements, all graduate students are required to demonstrate competence in statistical and quantitative methods through successful completion of Psychology 49.540 (with a grade of B- or better) or a qualifying examination. The qualifying examination is ordinarily scheduled during the first part of September, just prior to the registration period, and it encompasses the mate-

rial covered in Psychology 49.540. In the event of successful completion of the examination, another course is substituted for Psychology 49.540. In the case of M.A. students, the Department may recommend that a grade of C+ in Psychology 49.540 be accepted for credit (General Regulations, Section 11.2) only after successful completion of the qualifying examination. This option is limited to those who pass the examination within two successive offerings of it, and who maintain continuous registration as graduate students between the first registration in Psychology 49.540 and the taking of the examination.

In addition to fulfilling the remaining credit requirements as described in subsequent sections, all graduate students in psychology are expected to conduct research of interest to them during each year of graduate study. This requirement may be satisfied by independent research, serving as a research assistant, or by doing pilot or thesis research.

Each year, the candidate's adviser submits a written critique of research progress, and this becomes part of the candidate's permanent record. Qualifying-year students are evaluated at the end of the first twelve months.

Depending on his/her field of concentration, a candidate may be required to demonstrate an ability to read with understanding relevant technical material in a foreign language and/or to give satisfactory evidence of competence in such areas as computer techniques, electronic instrumentation, psychometrics, sampling procedures, or surgical techniques.

The Department may recommend that a graduate student be asked to withdraw from the program at any time if his or her progress in course work, research, or comprehensive examinations, proves unsatisfactory.

Within the Department exist subgroups of faculty members with common interests and subgroups of courses associated with particular areas of psychology. Below are listed four formally identified fields of concentration with the work which would be expected from any student who decided to pursue interests in one of these fields.

## Concentrations

### *Basic and Applied Social Psychology*

The concentration in social psychology is designed to provide students with a fundamental knowledge in the traditional fields of social psychology such as social psychological research methods, attitudes and personality, as well as the application of social psychology to current social issues such as family violence, health promotion, assessment and program evaluation, crime and delinquency, computers and the psychology of women. Faculty inter-

ests span a broad spectrum of perspectives in social, personality, community and applied social psychology. Current research in the Department includes historical and critical social psychology, laboratory investigations of social processes in decision making and attitudes, through the applied studies in areas such as family violence, women and the work force, the psychology of women, delinquency, criminal justice and corrections, health promotion, and performance enhancement.

Students interested in this area are encouraged to take courses such as 49.510, 49.511, 49.519 and 49.546, as well as generate theses in this area.

### *Concentration in Cognitive Psychology*

The concentration in cognition is intended to provide the graduate student with an advanced knowledge of methodological and theoretical issues in the domain of cognitive psychology. Research interests of regular and adjunct faculty in cognition include perception and psycho-physics, attention, pattern recognition, reading and language processing, cognitive development, learning and memory, problem solving, neuropsychology, and human-computer interactions. Students interested in this area are encouraged to take courses such as 49.570, 49.573, 49.574 and 49.670 and generate theses in the area of cognition.

### *Concentration in Developmental Psychology*

The concentration in developmental psychology is intended to provide graduate students with an in-depth knowledge of the theoretical and methodological issues associated with the study of child development from birth to adolescence. Faculty interests span the areas of language, cognitive, and social development. Current research in the Department includes topics related to literacy acquisition; bilingualism; peer relationships, aggression and shyness; learning disabilities; conduct disorders and antisocial behaviours; and consequences of offspring exposed prenatally to drugs. Students interested in this area are encouraged to take courses such as 49.551, 49.552, 49.650, and 49.651. Also it is expected that students in this field will generate a thesis in the area of developmental psychology.

### *Concentration in Neuropsychology*

Concentration in the area of neuropsychology occurs at the Ph.D. level. It is designed to provide students with background and skills relating to the diagnosis and evaluation of psychological disorders that arise from neurological problems and associated brain dysfunction syndromes. Students interested in this area are encouraged to take all four Ph.D. seminars: 49.661, 49.662, 49.663 and 49.664. Also, it is expected that students in this field generate theses in neuropsychology.

### *Specialization in Behavioural Neuroscience*

Behavioural Neuroscience is the study of the relation between behaviour and the nervous system. This specialty is cross-disciplinary, incorporating neuroanatomy, neurobiology, neuropharmacology, neurophysiology, psychiatry, psychology and cognitive studies. While individual researchers usually specialize in a particular area, behavioural neuroscientists must also be able to appreciate significant research in other fields of neuroscience.

Training in Behavioural Neuroscience extends beyond the boundaries of traditional departments. This area of concentration is offered as a collaborative Specialization in Behavioural Neuroscience by the Institute of Neuroscience at Carleton University and the School of Psychology at the University of Ottawa. Faculty members of the Institute of Neuroscience are from the Psychology and Biology departments and also include adjuncts from the large and diverse Ottawa Neuroscience community. To augment the scope of training provided, faculty members from the Department of Psychiatry (Institute of Mental Health Research, Royal Ottawa Hospital) also participate in the teaching, research training and student supervision. Further details on the Specialization, including faculty members of the Institute of Neuroscience and program requirements of the Specialization are listed on p. 263 of this calendar. Prospective students are encouraged to contact the Director of the Institute of Neuroscience for current research activities of the participating faculty.

### **Qualifying-Year Program**

Occasionally, candidates with exceptional promise who offer less than Honours B.A. status may be admitted to a qualifying-year program approved by the graduate studies committee and designed to prepare them for master's study. A grade of B- or better must be obtained in each qualifying-year course, and candidates may be required to complete satisfactorily the equivalent of an B.A.(Honours) thesis.

### **Master of Arts**

#### **Admission Requirements**

The normal requirement for admission into the master's program is an B.A.(Honours) (or its equivalent) with high honours standing and with credit in the following areas: statistics and design of experiments; experimental psychology; learning or motivation; physiology and/or comparative psychology; and history and/or systems.

Candidates with particular course deficiencies may be required to register in additional courses at Carleton.

The deadline for submitting applications for graduate study in psychology are as follows: February 1 for students requesting financial assistance; June 1 for students not requesting financial assistance but who are seeking admission in September; and November 1 for students not requesting financial assistance who are seeking admission in January.

### **Program Requirements**

The master's program usually consists of 3.0 credits, of which at least two must be at the graduate level (numbered 500 or higher), and a thesis (equivalent to 2.0 credits) which must be defended at an oral examination. Psychology 49.540, or the successful completion of the opting-out examination in quantitative methods, is required of all graduate students. Course credit will not be given for successful completion of the opting-out examination.

### **Master of Science**

The Department of Psychology offers the M.Sc. degree for those students in the behavioural neuroscience specialization. For the neuroscience specialization, the candidate must fulfill the normal program requirements together with the requirements of the specialization. For further details, see p.263.

### **Academic Standing**

A grade of B- or better is normally required in each of the credits counted towards the M.A. or M.Sc. degree. The Department is prepared on occasion to recommend to the Dean of the Faculty of Graduate Studies and Research that a candidate be allowed a grade of C+ in 1.0 credit or each of two 0.5 credits. In the case of Psychology 49.540, such a recommendation will be based on successful completion of the qualifying examination. This option is limited to those who pass the examination within two successive offerings of it, and who maintain continuous registration as graduate students between the first registration in Psychology 49.540 and the taking of the examination.

### **Doctor of Philosophy**

#### **Admission Requirements**

The requirements for admission to the Ph.D. program are outlined in the General Regulations section of this Calendar (see p.55). Scores on the Graduate Record Examination are optional.

The Ph.D. program in psychology normally will be undertaken on a full-time basis; however, in cases of exceptional merit, the Department will accept a few candidates for the degree on a part-time basis. The time limit for completion

of Ph.D. degree requirements for those who enter the program on a part-time basis will be the same as for those who enter on a full-time basis and subsequently register for part-time study: that is, eight calendar years. (See General Regulations, Section 13, Time Limits) (p.65).

Applicants should note that of the B.A., M.A., M.Sc., and Ph.D. degrees in Psychology, only two may ordinarily be taken at Carleton University.

## Program Requirements

The minimum program requirements for the Ph.D. degree in Psychology are as follows:

\* 10.0 credits, with a grade of B- or better in each credit

\* Psychology 49.540 (1.0 credit) or the opting-out examination; and one of Psychology 49.541, 49.542, 49.543 or 49.546 or other as approved by the graduate committee are required of all Ph.D. graduate students. In the case of success in the opting-out examination in 49.540, another 1.0 credit is substituted

\* Satisfactory completion of Psychology 49.695 (1.0 credits)

\* A thesis equivalent to 5.0 of the required 10.0 credits which must be defended at an oral examination

All Ph.D. candidates are required to submit a thesis prospectus. The prospectus examination will normally be successfully completed within seven calendar terms of the student's initial registration for full-time students and ten terms for part-time students.

## Comprehensive Examination

All Ph.D. candidates in psychology are required to successfully complete Psychology 49.695, Comprehensive Examination (1.0 credit). The Comprehensive examination includes both a written and an oral examination on a topic distinct from the topic of the thesis. The topic of the comprehensive examination shall be approved by the graduate studies committee of the Department of Psychology. There are two optional forms for the written and the oral examination: either a major essay or a research grant proposal. The submission of the written portion of the examination will be followed within one to three weeks by a comprehensive oral examination, which is not restricted to issues raised by the written portion.

The comprehensive examination must be completed successfully before the Ph.D. prospectus meeting is scheduled. Students are required to successfully complete the Comprehensive Examination by the end of the fourth term of the student's initial registration for full-time students in the Ph.D. program or by the end of

the sixth term of the student's initial registration in the part-time Ph.D. program.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Through inter-university cooperation in graduate instruction, full-time graduate students registered in the Department of Psychology may enrol in one course at the University of Ottawa.

Psychology 49.510F1

### Research Methods in Social Psychology

This course focuses on essential methodological issues in social psychology. These include experimental, quasi-experimental, correlational, survey and field research methods, as well as factors affecting the validity of findings and ethics.

Psychology 49.511W1

### Seminar in Social Psychology

This seminar deals with classic and current theoretical issues and research findings in the areas of social psychology, personality, community, social-developmental and applied social psychology.

Psychology 49.512F1, W1

### Group Processes

The interface between the person and the group has been alleged to be the uniquely defining feature of social psychology. This course examines the evidence for this assertion historically, and across cultures, in an attempt to place current publications in group processes in broader temporal and cultural contexts than research reports normally permit.

Psychology 49.513F1, W1

### Attitudes

This seminar will survey classic and contemporary theories and research examining the nature of attitudes, the attitude-behaviour relation, and factors affecting attitudes.

Psychology 49.514F1, W1

### Psychology of Women

This seminar will consider and evaluate research concerning the psychology of women, including research methods, gender roles and gender differences.

Psychology 49.515F1

**Fundamentals of Computing for Psychologists**

A survey of computer and communication hardware and software. The course is designed to make psychologists aware of concepts and terminology used by engineers and programmers in planning computer applications. The course will have a weekly laboratory. Prerequisite: One course in computer programming.

Psychology 49.516F1

**Applications of Computers to Thinking, Problem Solving, and Decision Making**

A survey of literature in such fields as artificial intelligence, database management, computer-aided instruction, simulation and forecasting, and computer-mediated communication. Psychological principles in the design, use, and evaluation of these cognitive aids will be stressed.

Prerequisite: Psychology 49.515.

Psychology 49.517F1, W1

**Psychology of Family Violence**

In this seminar, students examine the biopsychosocial antecedents and consequences of the abuse and neglect of children, partners and elders within the family. The efficacy of preventive and treatment strategies is also assessed, as are current controversies and research methods in the area.

Psychology 49.518F1

**Social Psychological Issues in Human Assessment**

A detailed critique of orthodox assessment methodologies and exposure to recent developments in the appraisal of human competencies, personality, and social interaction.

Psychology 49.519F1, W1.

**Historical and Social Foundations of Social Psychology**

This course is a history of psychological social psychology (1890's to 1960's). Emphasis is placed on the development of social psychology as both an experimental and an interpretive science. Some attention is given to historiographic issues and the history of the human sciences more generally.

Psychology 49.520 T2 (Biology 61.534)

**Basics of Neuroscience**

A comprehensive neuroscience course from cellular levels to neural systems and behavior. Topics covered include aspects of neuroanatomy, neurophysiology, neuropharmacology and behavioural and cognitive neuroscience. (Also listed as PSY6201 at the University of Ottawa)

Psychology 49.521F1, W1

**Environmental Psychology and Social Ecology**

This course considers research and applications in the fields of environmental psychology

and social ecology. Topics may include spatial behaviour, territoriality, behaviour setting analysis, personal space, psychological assessment of environments and psychological aspects of environmental design.

Psychology 49.522F1, W1

**Psychology and Criminal Justice**

A critical review of the contributions of psychological concepts, technology and research methodology to the analysis of selected issues in law and criminal justice. Topics may include victim studies, risk assessment, offender rehabilitation, police studies expert testimony, eyewitness testimony, and judicial decision making.

Psychology 49.523F1, W1

**Psychology in the Human Services**

This seminar will review and evaluate non-clinical roles for psychologists in the human services. The major roles reviewed include those of consultant, researcher, evaluator, trainer, and policy analyst.

Psychology 49.529F1 or W1

**Psychology of Health and Illness**

A critical examination of scientific theory and research on the role of psychological factors in health and illness, and the use of psychological interventions in treating illness and maintaining health. Topics include the biopsychological model of illness, stress and coping, psychoneuroimmunology, personality, and stress management.

Psychology 49.530W1

**Perceptual Processes**

Theoretical and empirical issues of the area of perception. The topics may include: psychophysics, constancies, depth perception, pattern recognition, iconic memory, attention, hemispheric specialization.

Psychology 49.531F1, W1

**Psychophysics**

A study of classic and contemporary psychophysical methods. Applications to cognition will be included.

Psychology 49.540T2

**Quantitative Psychology I: Univariate Techniques**

Applications of the general linear model including analysis of variance and multiple regression: prediction and estimation. Extensive use is made of computer statistical packages.

Psychology 49.541F1

**Quantitative Psychology II: Multivariate Techniques**

Applications of multivariate statistical techniques with psychological data including multivariate analysis of variance, canonical correlation, discriminant function analysis, and factor analysis. Extensive use is made of computer statistical packages.

Prerequisite: Psychology 49.540.

Psychology 49.542W1, S1

### **Descriptive and Nonparametric Statistics**

An overview of methods for assisting in the detection and explanation of patterns in data that do not satisfy parametric test assumptions. Topics may include exploratory data analysis, information analysis, prediction analysis, ordinal pattern analysis, and conceptual issues in statistics.

Prerequisite: Psychology 49.540.

Psychology 49.543W1, S1

### **Measurement and Scaling: Theory, Methods, and Applications**

Theoretical foundations and applications of extensive, conjoint, difference, utility and subjective probability, fundamental measurement systems are studied. Data theory, derived measurement systems, multidimensional scaling of similarities and preference data, and the related computer based routines are also explored.

Prerequisite: Psychology 49.540.

Psychology 49.546W1, S1

### **Quasi-experimental Design and Evaluation Research**

Coverage of methodological and statistical problems occurring in the field settings and program evaluations.

Prerequisites: Psychology 49.540, and one of 49.541, 49.542, 49.543.

Psychology 49.547F1

### **Tests and Measurements I: Intellectual/Cognitive**

This course is designed to assist students learning of basic cognitive/intellectual assessment procedures. Students will be required to administer and interpret a variety of tests such as the WAIS-R, Wechsler Memory Scale, Rey Auditory Verbal Learning Test, and Buschke's Cued Recall Test.

Prerequisite: Undergraduate course in testing or psychometrics.

Psychology 49.548W1

### **Tests and Measurements II: Personality**

This course is designed to assist students learning of basic projective and non-projective personality tests. Students will be required to administer and interpret a variety of personality tests such as MMPI, Rorschach, 16-PF, and STAI. Applied experience will be stressed.

Prerequisite: Psychology 49.547.

Psychology 49.551F1

### **Developmental Psychology I**

A detailed examination of selected issues in developmental psychology.

Psychology 49.552W1

### **Developmental Psychology II**

A continuation of 49.551.

Psychology 49.561W1

### **Contemporary Research in Personality**

Current controversial issues in personality research, and selected theoretical and research studies in personality.

Psychology 49.570F1

### **Advanced Topics in Cognition I**

An in-depth study of a specific topic in the area of basic cognitive processes. Topics will vary from year to year and may include judgmental processes, object identification, selective attention and spatial cognition.

Psychology 49.573W1

### **Cognition I**

A survey of issues and research methodologies in basic cognitive processes. Topics may include detection and processing of sensory signals, pattern recognition, attention, mental imagery and automaticity.

Psychology 49.574W1

### **Cognition II**

A survey of issues and research methodologies in higher-level cognitive processes. Topics may include memory, representation of knowledge, decision processes, and the procedural/declarative controversy. The course may be focused on a particular area (e.g. reading, transfer in problem solving).

Psychology 49.576W1

### **Behaviour Modification**

Special problems, topics, and projects related to behaviour modification.

Psychology 49.580F1, W1, S1

### **Special Topics in Psychology**

The topics of this course will vary from year to year, and will be announced in advance of the registration period.

Psychology 49.590F1, W1, S1

### **Directed Studies**

An investigation in depth of selected problems in psychology by means of directed library research. Registration is restricted, permission to register being granted only by the graduate committee. A final report must be filed in the departmental office prior to submission of course grade.

Psychology 49.591F1, W1, S1

### **Independent Research**

Permission to register and approval of research plan must be obtained from the graduate committee. A final research report must be filed in the departmental office prior to submission of course grade. The course may be repeated for credit.

Psychology 49.593F1, W1

### **Practicum in Psychology**

The practicum offers Masters level students the opportunity to gain experience in a range of applied psychology settings with the goal of

integrating academic and practical aspects of psychology. This course cannot be repeated for credit. Students will receive a grade of satisfactory or unsatisfactory. Details are available from the Department.

Psychology 49.599F4, W4, S4  
**M.A. Thesis**

Psychology 49.600F1

**Systems of Psychology**

Historical research methods on the study of psychological movements and problems of the late nineteenth and early twentieth centuries; may be repeated for credit. (Open with permission to advanced undergraduates.)

Psychology 49.613F1 or W1

**Sleeping and Dreaming**

Major emphasis will be placed on recent theory, method and measurement in sleep and dream research: developmental neuro-cognition, psychophysiology and chronobiology. Disorders of sleeping behaviour and experience; cross-species comparative approaches. Functions of sleeping and dreaming; effects of these behaviours on waking behaviour and experience.

Psychology 49.615F1

**Psychological Aspects of Computer Use**

An investigation of human factors related to the effective design of computer hardware and software. Topics may include the design and evaluation of information search procedures, graphic displays, and operation manuals on the assessment of usability. A research project will be required.

Psychology 49.616W1

**Social Aspects of Computer Use**

An investigation of the social psychological factors affecting the use of computers and the social consequences of their use. Topics may include the use of computers in higher education and the social consequences of the Internet for the Third World.

Psychology 49.620T2 (Biology 61.633)

**Advanced Seminar in Neuroscience**

A seminar focusing on the active research areas and interests of faculty, guest lecturers and graduate students as well as current trends in diverse areas of neuroscience. (Also listed as PSY 6202 at the University of Ottawa)

Prerequisite: Psychology 49.520.

Psychology 49.624F1, W1, S1 (Biology 61.624)

**Neuroscience Techniques I**

Completion of a research project carried out under the supervision of a neuroscience faculty member, normally not the current supervisor. The student will learn a new neuroscience technique and apply it to a research objective. The course can be repeated for different projects. Students must obtain approval from the Director of the Neuroscience

Psychology 49.630F1, W1

**Special Topics in Neuroscience**

An in depth study of current topics in neuroscience. Course content varies yearly and has recently included cognitive neuroscience, neuropharmacology, neurodegeneration, behavioural medicine and molecular neuroscience.

Psychology 49.650F1

**Research Seminar in Developmental Psychology I**

Psychology 49.651W1

**Research Seminar in Developmental Psychology II**

Psychology 49.661F1

**Seminar in Human Neuropsychology I**

A broad and intensive consideration of selected topics in human neuropsychology, integrating findings from psychology with related medical literature.

Psychology 49.662W1

**Neuropsychological Assessment**

Review of the rationale and practice of diagnosis and treatment based on neuropsychological test results. Reliability and validity of test batteries such as the Halstead-Reitan and the Luria-Nebraska are studied. Clinical analysis of patient protocols, including degenerative diseases, psychiatric disorders, seizures, head injury, brain tumors.

Prerequisite: Psychology 49.661.

Psychology 49.663F1

**Seminar in Human Neuropsychology II**

A broad and intensive consideration of selected topics in human neuropsychology, integrating findings from psychology with related medical literature.

Psychology 49.664W1

**Theories of Brain Dysfunction in Psychopathology**

A review of neuropsychological theoretical explanations and empirical findings regarding brain functioning in a variety of organic and psychiatric disorders, such as autism, schizophrenia, minimal brain dysfunction, anorexia nervosa, aphasia, and memory disorders. Disorders are examined from neurological, psychological, biochemical, and neuropsychological points of view.

Prerequisite: Psychology 49.661.

Psychology 49.670F1, W1

**Advanced Topics in Cognition II**

An in-depth study of a specific topic in higher-level cognitive processes. Topics will vary from year to year and may include mathematical knowledge and processes, problem solving, or models of reading.

Psychology 49.680F1, W1

**Special Topics in Psychology**

The topics of this course will vary from year to year, and will be announced in advance of the registration period.

Psychology 49.690F1, W1, S1

**Directed Studies**

Same description as 49.590.

Psychology 49.691F1, W1, S1

**Independent Research**

Permission to register and approval of research plan must be obtained from the graduate committee. A final research report must be filed in the departmental office prior to submission of course grade. The course may be repeated for credit.

Psychology 49.693F1, 49.694W1

**Practicum in Psychology**

The practicum offers PhD students the opportunity to gain experience in a range of applied psychology settings with the goal of integrating academic and practical aspects of psychology. This course cannot be repeated for credit. Students will receive a grade of satisfactory or unsatisfactory. Details are available from the Department.

Psychology 49.695F2, W2, S2

**Comprehensive Examination**

Available only to Ph.D. students. Students will receive a grade of *Satisfactory* or *Unsatisfactory*.

Psychology 49.699F, W, S

**Ph.D. Thesis**

# Public Policy and Administration

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## The School

**Director of the School,** F.D. Abele

**Coordinator, Canadian Concentration,** E.R. Swimmer

**Coordinator, Development Concentration,** M.A. Bienefeld

**Coordinator, Innovation, Science and Environment Concentration,** E.R. Swimmer

**Coordinator, Doctoral Program,** S.D. Phillips

The School of Public Policy and Administration at Carleton University is a leading national and international centre for teaching and research in public administration and public policy. Since being established in 1953, the School has helped to prepare individuals for professional careers and opportunities in the public sector, both in Canada and abroad.

The nature of the public sector has always been subject to change, but perhaps never more than in recent years. Today the public sector can be seen as embracing not only the traditional government departments and agencies, but also political organizations, interest groups, consulting and research firms, the voluntary sector, organizations that provide public services on contractual bases, as well as international agencies and institutions of higher learning. The graduate programs of the School treat the public sector in this contemporary context.

The School offers graduate programs of study and research in the fields of public administration and public policy leading to the Master of Arts in Public Administration, the Graduate Diploma in Public Administration, and the Doctor of Philosophy in Public Policy. These programs are designed both for individuals who wish to work in the public sector, and for those who are already doing so but who wish to broaden or strengthen their conceptual and technical skills. Prospective applicants are urged to consider carefully the alternative programs so as to select the one best suited to their interests, background, and academic qualifications.

The M.A. program provides a broad and balanced exposure to public policy development, public management and policy implementation. The D.P.A. program provides an introduction to the same subjects. Both the M.A. and the D.P.A. are offered in three alternative areas of concentration:

Canadian public administration and policy (the Canadian Concentration); development administration (the Development Concentration); and Innovation, Science and Environment Policy. The Development Concentration is offered in cooperation with the Norman Paterson School of International Affairs.

The Ph.D. program involves the intensive study of the formation and evolution of public policy in Canada and, from a comparative perspective, in countries of the OECD.

Each of these graduate programs is described in detail below. Further information or application packages can be obtained by contacting the School of Public Policy and Administration.

## Master of Arts

The overall objective of the M.A. program is to provide individuals with a balanced conceptual and technical ability to understand and contribute to policy development, public management, and policy implementation.

Under this objective, the Canadian Concentration provides an advanced understanding of the public sector through interdisciplinary insights drawn from political science, economics and management, as applied within the framework of Canadian and comparative institutions, laws and ideas. It also enables individuals to specialize in particular policy fields and aspects of management, both through study and through cooperative education in the public sector.

The Development Concentration provides an advanced understanding of the problems and opportunities that confront various types of national administrative systems and public sectors in their efforts to promote sustainable social and economic development in an increasingly interdependent and competitive global system.

The Innovation, Science and Environment Policy Concentration provides an advanced understanding of the problems and opportunities that confront governments, firms and society in making and implementing innovation, science and environment policies in an increasingly knowledge and information-based economy and society.

These overall and particular objectives are consistent with the School's view of what is fundamental to education in the field of public administration. This view is:

\* that democratic ideals and practices are central to government and to the public sector broadly defined

\* that a balance of conceptual and technical skills is needed to understand the linked activities of policy development (how and why policy is made), public management (how the public sector is structured, staffed and resourced) and policy implementation (how policy intentions are carried out, including the grievances and appeals of citizens and clients)

\* that these advanced conceptual and technical skills come from exposure to a variety of academic disciplines

\* that professional education in public administration and policy analysis requires a balance of theory and practice

The relevance of this view has been borne out by the success of graduates of the School who now work in many areas of the public sector, in Canada and abroad, including government departments, political organizations, interest groups, consulting and research firms, the voluntary sector, international agencies, and institutions of higher learning.

A co-op option is available to full-time students in the M.A. program. Students admitted to this option must satisfactorily complete at least two work terms in order to graduate with a co-op designation on their transcripts and diplomas. These work terms are four months in duration and locate students in government departments or other organizations in order to work at a junior officer level. They provide students with opportunities to integrate the theoretical and practical aspects of public administration. During a work term, students will register in one of the co-op work term courses: Administration 50.531, 50.532, or 50.533. While on a work term, students are limited to an additional 0.5 credit course.

## Program Schedules

The M.A. program may be taken under three schedules: full time, part-time or a mixture of the two.

\* The full-time schedule enables students to complete the program in two years (four or five academic terms).

\* The part-time schedule enables students, taking from two to four half credits over one year, to complete the program in five to eight years. Courses are regularly scheduled in evening sections.

\* The mixed full-time, part-time schedule enables students to complete the program in a period intermediate to those above. The mixed schedule applies to full-time students who shift to part-time study during a cooperative placement, or part-time students who shift to full-time study in the event of study leave.

The duration of the program depends upon the advanced standing with transfer of credit that students receive upon admission. Advanced standing is discussed below under program requirements.

## Admission Requirements

Applicants must have a demonstrated ability to study and communicate in English. A TOEFL score of 580 or higher is normally required for students whose first language is not English.

Applicants must have a bachelor's degree (or the equivalent) with high honours standing or better from a recognized university. The level of academic performance and potential demonstrated within the degree is more important than the discipline. Indeed, students enter the program from a wide variety of academic backgrounds in the social sciences, humanities, sciences and engineering. The School also considers mid-career applicants who do not have a bachelor's degree, but who have demonstrated professional excellence over several years of managerial work in the public sector.

Applicants must have completed a university course covering micro- and macroeconomic theory (Economics 43.100 or the equivalent), with the required standing. In addition, applicants must have a working knowledge of algebra.

Applicants to the Canadian Concentration and the Innovation, Science and Environment Concentration must have completed one university course in Canadian government (Political Science 47.202★ and 47.203★ or the equivalent), with the required standing.

Note that, because of the number of applications received, possession of these admission requirements does not, in itself, guarantee admission to the program.

Application packages may be obtained by contacting the School of Public Policy and Administration. Applicants for full-time study who wish to be considered for financial assistance and scholarships must ensure that all application materials are received by March 1.

## Program Requirements

The M.A. program comprises 10.0 credits. Upon admission, students may receive advanced standing with transfer of credit for up to 4.0 required credits. Under the Canadian Concentration no more than three of these courses may be from 50.504, 50.510, 50.511, 50.524, and 50.563. Under the Development Concentration, no more than two of these courses may be from 50.511, 50.517, 50.524, 50.552, and 50.588. Under the Innovation, Science and Environment Concentration no more than two of these courses may be from

50.501, 50.502, 50.508 and 50.587. Advanced standing is granted only if previous academic work is judged to be equivalent to the required courses. Advanced standing will be determined on an individual basis on consultation with the School and the Faculty of Graduate Studies and Research and pursuant to Section 6.1 of the General Regulations section of this Calendar. In general, a grade of B+ or better is necessary in the equivalent courses in order to receive advanced standing.

The composition of the required and optional courses that make up the M.A. program differs between the Canadian, the Development, and the Innovation, Science and Environment Policy Concentrations.

*Canadian Concentration*

10.0 credits consisting of:

**A. 6.0 required credits:**

**(i) Administration 50.500**

Administration 50.522

Administration 50.523

Administration 50.530

Administration 50.536

Administration 50.551

Administration 50.552

Administration 50.567

Administration 50.568

**(ii) 1.5 credits chosen from:**

Administration 50.504

Administration 50.510

Administration 50.511

Administration 50.524

Administration 50.563

**B. 4.0 optional credits consisting of:**

**(i)** 0.5 credit selected from each of streams 1, 2 and 3 listed below, and 2.5 credits selected from any of the streams, or from graduate courses in other disciplines if approved by the graduate supervisor; or

**(ii)** A thesis (equivalent to 2.0 credits) and 2.0 credits selected from any of the streams, or from graduate courses in other disciplines, if approved by the graduate supervisor; or

**(iii)** A research essay (equivalent to 1.0 credit) and 3.0 credits selected from any of the streams, or from graduate courses in other disciplines, if approved by the graduate supervisor

Note that students may take as options any of the required courses over and above the minimum number specified.

*Development Concentration*

10.0 credits consisting of:

**A. 5.5 required credits:**

**(i) Administration 50.501**

Administration 50.523

Administration 50.530

Administration 50.551

Administration 50.563

Administration 50.568

International Affairs 46.507

International Affairs 46.508

International Affairs 46.537

**(ii) 1.0 credit chosen from:**

Administration 50.511

Administration 50.517

Administration 50.524

Administration 50.552

Administration 50.588

**B. 4.5 optional credits consisting of:**

**(i)** 4.5 credits from streams 1, 2 and 3 listed below, or from graduate courses in other disciplines if approved by the graduate supervisor; or

**(ii)** A thesis (equivalent to 2.0 credits) and 2.5 credits selected from any of the streams, or from graduate courses in other disciplines, if approved by the graduate supervisor; or

**(iii)** A research essay (equivalent to 1.0 credit) and 3.5 credits selected from any of the streams, or from graduate courses in other disciplines, if approved by the graduate supervisor

Note that students may take as options any required courses over and above the minimum number specified.

*Innovation, Science and Environment Policy Concentration*

**A. 10.0 credits consisting of:**

**(i) 7.0 required credits:**

Administration 50.523

Administration 50.530

Administration 50.540

Administration 50.541

Administration 50.543

Administration 50.544

Administration 50.551

Administration 50.552

Administration 50.560  
 Administration 50.567  
 Administration 50.568  
 One of Business 42.570 or Business 42.571

(ii) 1.0 credit chosen from:

Administration 50.501  
 Administration 50.502  
 Administration 50.508  
 Administration 50.587

**B. 3.0 optional credits consisting of:**

(i) 0.5 credit selected from each of Stream 1, 2 and 3 listed below, and 1.5 credits selected from any of the streams, or from graduate courses in other disciplines if approved by the graduate supervisor, or

(ii) A thesis (equivalent to 2.0 credits) and 1.0 credits selected from any of the streams, or from graduate courses in other disciplines if approved by the graduate supervisor, or

(iii) A research essay (equivalent to 1.0 credit) and 2.0 credits selected from any of the streams, or from graduate courses in other disciplines if approved by the graduate supervisor.

Note that students may complete as options any of the required courses over and above the minimum number specified.

### **Stream 1 - Policy Fields**

50.508, 50.509, 50.540, 50.559, 50.560, 50.564, 50.570, 50.571, 50.572, 50.573, 50.574, 50.586, 50.587, 50.588, 50.589

### **Stream 2 - Public Management and Institutional Relations**

50.503, 50.506, 50.515, 50.516, 50.517, 50.519, 50.538, 50.541, 50.581, 50.584

### **Stream 3 - Advanced Analysis**

50.502, 50.507, 50.513, 50.520, 50.525, 50.528, 50.537, 50.543, 50.544, 50.562, 50.569, 50.575

### **Academic Standing**

All candidates are required to obtain a grade of B- or better in each course in the program. A candidate may, with the recommendation of the School and the approval of the Dean of the Faculty of Graduate Studies and Research, be allowed one grade of C+.

## **Graduate Diploma in Public Administration**

The D.P.A. program provides an introduction to the subjects of policy development, public management, and policy implementation. Students enter the program with widely varying backgrounds, including those who already have advanced degrees but who wish to strengthen or broaden their conceptual and technical skills in public administration.

### **Program Schedules**

The D.P.A. program can be taken under three schedules; full time, part time or a mixture of the two. The duration of the program is approximately half that described for the M.A. program.

### **Admission Requirements**

The requirements for admission to the Canadian, the Development and the Innovation, Science and Environment, Policy Concentrations of the D.P.A. are identical to those described for the M.A. Note, however, that students in the D.P.A. are not eligible to receive financial assistance.

### **Program Requirements**

The D.P.A. program comprises 5.0 credits. Upon admission, students may receive advanced standing with transfer of credit for up to 1.0 credit. Advanced standing is granted only if previous academic work is judged to be equivalent to those courses. Advanced standing will be determined on an individual basis on consultation with the School and the Faculty of Graduate Studies and Research and pursuant to Section 6.1 of the General Regulations section of this Calendar. In general, a grade of B+ or better is necessary in the equivalent courses in order to receive advanced standing.

The composition of courses that make up the D.P.A. program differs between the Canadian, the Development, and the Innovation Science and Environment Policy Concentrations.

#### *Canadian Concentration*

5.0 credits selected from:

- \* Administration 50.500
- \* Administration 50.504
- \* Administration 50.510
- \* Administration 50.511
- \* Administration 50.522
- \* Administration 50.523
- \* Administration 50.524
- \* Administration 50.530

- \* Administration 50.536
- \* Administration 50.551
- \* Administration 50.552
- \* Administration 50.563
- \* Administration 50.567
- \* Administration 50.568

No more than three of the courses may be selected from Administration 50.504, 50.510, 50.511, 50.524 and 50.563.

#### *Development Concentration*

5.0 credits selected from:

- \* Administration 50.501
- \* Administration 50.511
- \* Administration 50.517
- \* Administration 50.523
- \* Administration 50.524
- \* Administration 50.530
- \* Administration 50.551
- \* Administration 50.552
- \* Administration 50.563
- \* Administration 50.568
- \* Administration 50.588
- \* International Affairs 46.507
- \* International Affairs 46.508
- \* International Affairs 46.537

No more than three of the courses may be selected from Administration 50.511, 50.517, 50.524, 50.552, and 50.588.

#### *Innovation, Science and Environment Concentration*

5.0 credits selected from:

- \* Administration 50.501
- \* Administration 50.502
- \* Administration 50.508
- \* Administration 50.523
- \* Administration 50.530
- \* Administration 50.540
- \* Administration 50.541
- \* Administration 50.543
- \* Administration 50.544
- \* Administration 50.551
- \* Administration 50.552
- \* Administration 50.560

- \* Administration 50.567
- \* Administration 50.568
- \* Administration 50.587
- \* One of Business 42.570 or 42.571

No more than two of the courses may be selected from Administration 50.502, 50.508, 50.565, 50.501, and 50.587

## **Academic Standing**

All candidates are required to obtain a grade of B- or better in each course in the program. A candidate may, with the recommendation of the School and the approval of the Dean of the Faculty of Graduate Studies and Research, be allowed one grade of C+.

## **Doctor of Philosophy**

The doctoral program in public policy has two primary objectives:

- \* to contribute to the advancement of research and teaching based on one or more of the various approaches to the political economy of public policy (in OECD countries)

- \* to develop scholars and researchers for positions in universities, private research institutions, and various other public and private organizations

While the School's M.A. degree outlined above offers exposure to both policy and management, the Ph.D. focuses directly on the study of public policy from both Canadian and comparative perspectives. The formation and evolution of policy in Canada is a primary focus of the program. In addition, Canadian, European, and other international students interested in research with a European-Canadian and North American comparative perspective will also find the program conducive to their work in the fields of specialization offered. Areas of research specialization within the School include: policy institutions and instruments, industrial policy, and social and labour market policy.

A distinguishing feature of the School of Public Policy and Administration is the presence of faculty who strive to integrate political science and economics in their research and teaching. The Ph.D. program is to a considerable extent based on the view that political economy is essential to an understanding of the public sector. It is also based on the view that analyses of what governments do must address the interplay among the various policy fields, instruments, and institutions.

## **Degree Schedule**

The program consists of three academic terms of course work plus preparation and completion of one comprehensive examination, as well

as a doctoral thesis. The Ph.D. program in Public Policy normally will be undertaken on a full-time basis; however, in cases of exceptional merit, the School may accept a few candidates for the degree on a part-time basis.

## Admission Requirements

Admission will be judged primarily on the applicant's ability to conduct advanced research and to complete the program successfully. Applications should contain at least one essay or paper at the M.A. level written by the applicant. Enrollment is limited and possession of the minimum requirements does not, in itself, guarantee acceptance. To be eligible for financial assistance, application for admission for the fall term must be completed no later than March 1.

Admission requires completion of an M.A. degree in any of public administration, political science, economics, political economy, business administration, law, or similar degree with first class standing (A- average or better in their M.A. work).

Students are advised that a working knowledge of basic calculus is required for completion of the program. Assistance in acquiring these skills is provided by the program. Students requiring additional assistance should consult the Ph.D. co-ordinator.

Applicants must also successfully complete prerequisites in statistics, political science, and economics as described in detail below. These prerequisites may be satisfied by the completion of appropriate course work at the intermediate undergraduate level or higher in each of the subjects listed.

Completed statistics courses should be approximately equivalent to Administration 50.552 described under Master of Arts, p.299. Candidates may, with permission of the School, satisfy the statistics prerequisite by completing this course with at least B+ standing concurrently with the Ph.D. program.

Prerequisites in political science and economics must be completed prior to entry. Completed courses in political science should be approximately equivalent to Administration 50.567 or Administration 50.568. With permission of the Graduate Coordinator, this requirement may be done, as a directed study in the summer, prior to registration in the program, under the supervision of faculty in the School. Completed courses in economics should be approximately equivalent to Administration 50.523. This course is usually offered at the School in the summer term and equivalent courses may be taken at most universities throughout the academic year. Applicants should seek advice from the supervisor of the Ph.D. program about whether particular courses are acceptable as prerequisites.

## Advanced Standing

Advanced standing will not normally be granted for any of the required courses described below. If granted, advanced standing will be limited to 1.0 credit.

## Program Requirements

The program consists of the following elements:

- \* 4.5 credits of course work
- \* Preparation for and writing of one comprehensive examination, normally written in August of the first year
- \* Public defence of a written thesis proposal
- \* A thesis equivalent to 4.5 credits
- \* A language requirement

## Course Component

Courses will normally be taken in the First year, and the fall of the Second year. Students in the doctoral program are required to complete the following:

- \* Six 0.5 credits; Administration 50.604, 50.605, 50.606, 50.607, 50.608, 50.609. A GPA of 9.0 (B+) or better overall must be obtained in these courses before proceeding to the comprehensive examination.
- \* Administration 50.610
- \* 1.0 credit that constitutes one area of specialization beyond the public policy foundations covered in the core courses. These courses will be chosen by the student after consultation with, and approval by, the student's academic supervisor and the Ph.D. co-ordinator

These courses will normally be graduate courses offered by the School or by the Departments of Political Science and Economics, or directed studies (50.691 and 50.692). However, other courses may be approved. Doctoral students taking courses at the master's level will be subject to enhanced course requirements. When necessary, students must arrange formal approval from the relevant department for admission to courses.

## Comprehensive Examinations

Students will write a general comprehensive examination, normally in August of the First year. This examination will focus primarily on material emanating from the required first year courses. At the discretion of the examining board, a candidate whose performance is not fully satisfactory may be asked to take an oral examination or a second written examination.

Preparation for the comprehensive examination will be assisted through a tutorial as described below.

## Thesis

Following the successful completion of the comprehensive examinations, students will prepare a formal thesis proposal under a committee composed of the supervisor and two other faculty members. The thesis supervisor will normally be a faculty member from the School of Public Policy and Administration. Each committee must consist of at least one political scientist and one economist. Under normal circumstances, the proposal must be defended by the end of the fall term of the third year of full-time registration. The thesis must demonstrate an advanced ability to integrate the politics and economics of public policy. The thesis must be defended at an oral examination.

## Language Requirement

A reading knowledge of French will be required according to normal university Ph.D. language examination procedures. Another language may be substituted for French if it is essential for the thesis.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

### Required Courses - M.A.

Administration 50.500

#### **Public-Sector Management and the Canadian Political System**

An examination of the principles and processes of public sector management as it functions through the institutions of cabinet-parliamentary government. Both institutional reforms and changes in the philosophy of public sector management are examined in the Canadian federal government and in a comparative context.

Administration 50.501

#### **The International Policy Framework**

An examination of the international initiatives and rules within which national development policies are developed and implemented.

Administration 50.502

#### **The Political Economy of Regulation**

An examination of political, economic, legal, and organizational theories of regulation in the Canadian and comparative context, and of the processes and consequences of regulatory practice in selected Canadian public policy fields.

Prerequisite: Administration 50.568.

Administration 50.504

#### **Implementation, Service Delivery, and Compliance**

An examination of the theory and practice of policy implementation, service delivery, and compliance in relation to Canadians as citizens and customers.

Administration 50.508

#### **Environmental Policy**

An examination of Canadian environmental policies and programs set in a comparative political-economic and institutional context. Also offered at the undergraduate level, with difference requirements, as Public Administration 50.408★, for which additional credit is precluded.

Administration 50.510

#### **Management Accounting**

An introduction to the principles and concepts of financial and management accounting. It includes illustrations of how accounting data can assist in the decision-making process of private and public organizations, and the limitations of that data.

Administration 50.511

#### **Financial Management**

An introduction to several concepts and techniques relevant to obtaining long term funds (debt and equity), and to comparing alternative uses of those funds (NPV and IRR). Other topics may include: financial ratios; pension management; and derivative contracts.

Administration 50.517

#### **Project Management**

An examination of the managerial, organizational and financial issues and processes involved in the development and implementation of development projects.

Administration 50.522

#### **Macroeconomics for Management and Policy**

Introductory knowledge of macroeconomics is presumed (subjects such as aggregate supply and demand, and concepts such as the multiplier). Contemporary macroeconomic issues (including active short-run stabilization policy, long-run growth, deficits and debt) and the conceptual frameworks available to analyze these issues.

Administration 50.523

#### **Microeconomics for Management and Policy**

Introductory knowledge of microeconomics is presumed (subjects such as the competitive model and concepts such as elasticity). Consumer and producer theory, and certain exceptions to the competitive model that are particularly relevant to public policy (including externalities, public goods, imperfect competition).

Administration 50.524

### **Applied Microeconomic Policy Analysis**

An examination of how microeconomic theory can be applied to analyze actual public policy problems and issues.

Prerequisite: Administration 50.523.

Administration 50.530

### **Organization Theory**

Major theoretical approaches to the study of organizations, including bureaucratic theory, scientific management, human relations, class theory and gender theory. Developments such as technology and organization, total quality management, empowerment and democratization strategies, and quality of working life. Prerequisite: Administration 50.500\* or the equivalent.

Administration 50.531

### **Co-operative Work Term**

Prerequisites: Registration in the Co-operative Education Option of the Master of Arts program and permission of the School.

Administration 50.532

### **Co-operative Work Term**

Prerequisites: Registration in the Co-operative Education Option of the Master of Arts program and permission of the School.

Administration 50.533

### **Co-operative Work Term**

Prerequisites: Registration in the Co-operative Education Option of the Master of Arts program and permission of the School.

Administration 50.536

### **Law of Public Authorities I**

The legal environment of Canadian public administration, Canadian law, institutions and processes. Introduction to Canadian legal history, adversarial adjudicative procedure, delegating power to public authorities. Criminal prohibition and licensing to influence behaviour, procedural justice in government decision making, controls on public authorities, enforcement of ethics.

Administration 50.540

### **Science and Technology Policies**

An examination of theory and practice regarding governmental policies for science and technology, and regarding the use of scientific or objective knowledge in the policy and regulatory processes of government. The course examines concerns regarding the ethical issues and the transparency of science in government.

Administration 50.541

### **Technology, Firms and Systems of Innovation**

An examination of broad theories of the political economy of technological change. Such theories include those informed by neo-classical economics, recent evolutionary economic and institutionally oriented innovation studies.

Administration 50.543

### **Science, Risk and Evaluation**

An examination of risk-benefit theories and practices and related issues in the evaluation of science and technology; including how they are handled in applied regulatory and policy institutions in selected sectors (e.g. Pesticides; health protection; biotechnology).

Administration 50.544

### **The Nature of Science**

An examination for non-scientists of key ideas and concepts of science crucial to understanding science as an intellectual activity and experimental process. Ideas and concepts are linked to key areas where policy must have a scientific underpinning (e.g. Eco-systems, energy and resources, biotechnology, biodiversity and radiation).

Administration 50.551

### **Quantitative Methods I**

An introduction to: descriptive statistics which are used to summarize information; probability theory and sampling distributions, which permit researchers to make valid predictions about population parameters from sample statistics; and the testing of hypotheses about quantitative and qualitative population parameters.

Administration 50.552

### **Quantitative Methods II**

The use of correlation and regression analyses to test hypotheses about the relationships between social-economic variables. The course covers simple-linear and multiple regression techniques, the underlying assumptions of ordinary least squares regression, and what can be done when some of these assumptions are violated.

Prerequisite: Administration 50.551.

Administration 50.560

### **Sustainable Development and Industrial and Innovation Policy**

An examination of sustainable development ideas and ethics and their links to Canadian and comparative industrial and innovation policies including policies that affect: Research & Development incentives, intellectual property, trade and competition, and the knowledge-based services delivered by government to business and consumers. Also offered at the undergraduate level, with different requirements, as Public Administration 50.460\*, for which additional credit is precluded.

Administration 50.563

### **Qualitative Research in Public Organizations**

This course deals with methods used in qualitative social research. The topics covered include the formulation of research problems, research design and techniques for collecting and managing non-quantitative evidence, and

the role of qualitative research in the analysis of public policies and programs.

Prerequisite: Administration 50.562.

Administration 50.567

### **Political Economy of the State**

An examination of theories of the modern state, drawing on different political economy traditions (for example, liberal, institutional, marxist, feminist). It provides an understanding of the central debates on the proper role of government that have shaped the state in the past, and that are currently shaping it for the future.

Administration 50.568

### **Policy and Decision Making**

An examination of policy analysis: definition, design, implementation, evaluation. Formal institutional structures and processes of policy formulation and implementation, theoretical issues concerning how policy is grounded in an understanding of the state, democracy and citizenship.

Prerequisites: Administration 50.500 or the equivalent and 50.567.

Administration 50.587

### **Trade Policy**

An examination of Canadian multilateral and regional trade policies and programs set in a comparative political-economic and institutional context. Also offered at the undergraduate level, with different requirements, as Public Administration 50.487, for which additional credit is precluded.

Administration 50.588

### **Structural Adjustment Policy**

An examination of structural adjustment policies and programs with a comparative focus on developing countries, but also including their relations with developed countries.

International Affairs 46.507

### **Theories of Development and Underdevelopment**

A comparative analysis of approaches to the study of development processes and underdevelopment, including structural-functional, neo-classical, Marxist, and dependency theories.

International Affairs 46.508

### **Development Planning: Theory and Practice**

Third World development plans and strategies and their impacts; techniques employed in development planning, including social cost-benefit analysis, budgeting, and problems in development administration.

International Affairs 46.537

### **Macroeconomics in a Development Context**

An examination of macroeconomic theory and policy in the context of the developing countries, with special emphasis upon theory and

policy for open economies, structural adjustment to international disequilibrium, exchange rate and balance of payments management, fiscal and financial policy.

## **Optional Courses - M.A.**

Note: Optional courses may only be taken when the student has completed at least nine required 0.5 credits or has obtained advanced standing in same.

Administration 50.503

### **Policy and Administration in Intergovernmental Relations**

An examination of the major cost-sharing and fiscal transfer agreements, and the intergovernmental mechanisms for policy and administrative coordination in selected policy fields.

Administration 50.506

### **Social Movements, Interests and the Policy Process**

An examination of the roles of social movements and interests in the policy process in a Canadian and comparative context.

Administration 50.507

### **Comparative Research on Policy and Policy Management**

An examination of methodologies and issues of comparative research on policy and public management among and between developed and developing countries.

Administration 50.509

### **Health Policy**

An examination of Canadian health policies and programs set in a comparative political-economic and institutional context. Also offered at the undergraduate level, with different requirements, as Public Administration 50.409\*, for which additional credit is precluded.

Administration 50.513

### **Budget Decision Making and Budgeting**

A study of selected aspects of the expenditure and revenue budget and budgetary process at all levels of government. Student papers are oriented towards critical review of actual budgets and budgetary processes.

Prerequisites: Administration 50.523 and 50.568.

Administration 50.515

### **Management in the Public Service**

An examination through cases and research of selected problems and issues in public service management. The specific focus of the course will change each year; some topics include human resources management, government investment, and pricing decisions.

Administration 50.516

### **Urban and Local Government Management**

An analysis of the principal issues and processes of Canadian urban and local government management and administration.

**Administration 50.517****Project Management**

An examination of the managerial, organizational and financial issues and processes involved in the development and implementation of development projects.

**Administration 50.519****Management in the Para-Public Sector**

An examination of managerial theory and practice in the para-public sector including voluntary organizations, interest groups, state-owned and mixed enterprises, and partnership arrangements.

**Administration 50.520****Public-Sector Investment and Pricing**

An examination of theory and practice related to decision making about public-sector investment and pricing policy, particularly large-scale projects and programs. Applied cost-benefit analysis (discount rates, marginal cost and shadow pricing, and the handling of risk and uncertainty) in large-scale public investment choices.

Prerequisite: Administration 50.523

**Administration 50.525****The Canadian Economy**

An overview of Canadian economic development and how it has been affected by governments. Topics may be drawn from monetary, fiscal, industrial, trade, labour-market or competition policies, viewed in contemporary and historical contexts.

Prerequisites: Administration 50.522 and 50.523.

**Administration 50.528****Management Information Systems**

An examination of the fundamentals of MIS: the nature of systems, information, and management processes, including concepts of data-processing technology, systems design, organizational impacts of information systems, and hardware and software considerations.

**Administration 50.537****Law of Public Authorities II**

An examination of characteristics and selected problems of control of administrative action. Topics include: varieties of traditional and constitutional, legal and judicial control, impact of the Charter, reforms to administrative law control systems in Canada, and comparisons with developments outside Canada. Also offered at the undergraduate level, with different requirements, as Law 51.457 for which additional credit is precluded.

Prerequisite: Administration 50.536.

**Administration 50.538****The Management of Provincial Government**

A comparative analysis of public-sector management structures and processes at the provincial level of government. Topics examined

include personnel and financial systems, regional administration, public utilities, direct interprovincial program and project management, and international activities of provinces.

Prerequisite: Administration 50.500 or the equivalent.

**Administration 50.559****Tax Policy**

An examination of Canadian tax policies set in a comparative political-economic and institutional context. Also offered at the undergraduate level, with different requirements, as Public Administration 50.459, for which additional credit is precluded.

**Administration 50.562****Planning and Evaluation in Government I**

An examination of selected concepts, issues, and processes in applied governmental planning and evaluation, utilizing both Canadian and comparative experiences.

**Administration 50.564****Social Policy**

A seminar which will study the nature and historical development of social programs and the welfare state in capitalist countries, with particular focus on Canada. The course will concentrate on developing a critical understanding of the social forces shaping these programs and evaluating the implications of current debate on the future of social policy in Canada. Also offered at the undergraduate level, with different requirements, as Public Administration 50.464, for which additional credit is precluded.

**Administration 50.569****Economic Models of Politics**

An introduction to the application of microeconomic conceptual frameworks to political processes. Topics may include: types of market failure; interest group formation; collective choice mechanisms; the influence of legislative institutions on policy outcomes; principal-agent relationships and the bureaucracy. Prerequisite: Administration 50.523.

**Administration 50.570****Policy Seminar**

An examination of one or more selected policy areas. The focus will be an analytical assessment of the selected policy area in terms of its many-sided economic, political, social, legal, quantitative, and administrative complexities. The policy field will change each year.

**Administration 50.571****Gender and Public Policy**

An examination of policy and policy making as they pertain to gender relations within the state as well as in society at large. The course looks at the negative and positive effects of public policy on gender relations in the family and the labour market. Also offered at the undergraduate

ate level, with different requirements, as Public Administration 50.471, for which additional credit is precluded.

Administration 50.572, 50.573

#### **Policy Seminars**

An examination of one or more selected policy areas. The focus will be an analytical assessment of the selected policy area in terms of its many-sided economic, political, social, legal, quantitative, and administrative complexities. The policy field will change each year.

Administration 50.574

#### **Regional Policy**

Theory and practice of regional policy - the Canadian and Third World experience. Regionalism and regional economic concerns, alternative policy approaches, a critical review of Canadian efforts with emphasis on how federalism shapes perceptions of regional issues and influences the approach to solutions. Also offered at the undergraduate level, with different requirements, as 50.474 for which additional credit is precluded.

Administration 50.575

#### **Advanced Statistical Policy Analysis**

An examination of econometric research on selected policy issues. The issues considered vary each year and the analysis incorporates the study of selected econometric techniques. The course enables students to evaluate critically applied econometric studies of public policy.

Administration 50.581

#### **Human Resources Management**

An introduction to the field of human resources management including the roles of human resource departments, employee motivation, staffing, compensation, benefits, training and development and employee relations.

Administration 50.584

#### **Industrial Relations and Public Sector Collective Bargaining**

An analysis of the basic concepts of industrial relations, with respect to both public- and private-sector employees and organizations.

Administration 50.586

#### **Aboriginal Policy**

An examination of Canadian policies and programs on aboriginal peoples and aboriginal peoples' own policies as nations set in a comparative political-economic and institutional context. Also offered at the undergraduate level, with different requirements, as Public Administration 50.486, for which additional credit is precluded.

Administration 50.589

#### **Education Policy**

An examination of Canadian policies and programs on education set in a comparative political-economic and institutional context. Also

offered at the undergraduate level, with different requirements, as Public Administration 50.489, for which additional credit is precluded.

Administration 50.591

#### **Directed Studies**

A tutorial or directed reading course on selected subjects.

Administration 50.592

#### **Directed Studies**

A tutorial or directed reading course on selected subjects.

Administration 50.593

#### **Directed Studies**

A tutorial or directed reading course on selected subjects.

Administration 50.597

#### **Special Project in Development Administration**

Administration 50.598F2, W2, S2

#### **Research Essay**

Administration 50.599F4, W4, S4

#### **M.A. Thesis**

### **Required Courses - Ph.D**

Note: All courses are 0.5 credit (one-term) courses unless otherwise indicated. Ph.D. courses are open to master's students with approval of the School.

Administration 50.604

#### **Policy Fields, Instruments and Institutions I**

An examination of comparative and Canadian theories and analyses of policy fields, instruments and institutions, with emphasis on selected fields (including social, labour market and industrial policy) and instruments (including public expenditure, taxation and regulation.)

Precludes additional credit for Administration 50.600.

Administration 50.605

#### **Policy Fields, Instruments and Institutions II**

An examination of different approaches to understanding the roles of ideas, interests, and institutions in the policy process from a political science perspective. Topics may include discourse coalitions, policy learning, neo-institutionalism, policy communities, citizenship, community and contemporary challenges to democratic government.

Precludes additional credit for Administration 50.600.

Administration 50.606

#### **The Political Economy of Public Policy I**

An examination of various structural approaches to the political economy of public policy, in-

cluding institutional, marxist, and other broad frameworks. Emphasis is placed on the contribution of these approaches to our understanding of social and economic changes and the role of public policy in shaping them. Precludes additional credit for Administration 50.601.

Administration 50.607

**The Political Economy of Public Policy II**

An examination of the microanalytic foundations of the political economy of public policy, with application to selected policy issues. Topics may include welfare economics and public goods, group formation, collective choice mechanisms, voting behaviour, evolution of institutions and norms, principal-agent problems, and bureaucracy.

Precludes additional credit for Administration 50.601.

Administration 50.608

**Economics of Public Policy I**

An examination of advanced topics in microeconomic theory, including consumption, production and industrial organization, with application to selected policy issues.

Precludes additional credit for Administration 50.602.

Administration 50.609

**Economics of Public Policy II**

Selected application of economic theory to various contemporary public policy problems and issues. Topics chosen for study will vary from year to year. Emphasis is placed on the presentation by students of critical analyses of relevant literature.

Precludes additional credit for Administration 50.602.

Administration 50.610F1, W1, S1

**Public Policy Research**

An examination through analyses of selected current research projects of basic applied research issues, philosophies, and problems in public policy research.

Precludes additional credit for Administration 50.603.

Administration 50.690F2, W2, S2

**Ph.D. Tutorial**

A tutorial specifically designed as preparation for the general comprehensive examination, under the direction of two or more faculty members. The grade to be awarded will be that obtained on the general written examination.

Administration 50.691 F1, W1, S1

**Ph.D. Specialization Tutorial**

A Ph.D. tutorial covering advanced theory and research in an area of specialization generally related to public policy. Specific topics will be selected in consultation with, and must be approved by, the academic supervisor and Ph.D. coordinator.

Administration 50.692 F1, W1, S1

**Ph.D. Specialization Tutorial**

A Ph.D. tutorial covering advanced theory and research in an area of specialization generally related to public policy. Specific topics will be selected in consultation with, and must be approved by, the academic supervisor and Ph.D. coordinator.

Administration 50.699F10, W10, S10

**Ph.D. Thesis**

Students will normally be supervised by faculty in the School of Public Administration but may also seek supervision from faculty in other social science departments, schools, and institutes.

## Religion

Dunton Tower 2121  
Telephone: 520-2100

### The Program

**Coordinator and Supervisor of Graduate Studies, J.G. Ramisch**

The Religion program offers studies leading to the Master of Arts.

### Master of Arts

#### Admission Requirements

**Please Note:** Admission to the M.A. program in Religion has been suspended.

The minimum requirement for admission to the master's program is an Honours bachelor's degree in religion (or the equivalent) with at least high honours standing.

Applicants who do not hold an Honours degree in religion (or the equivalent) will be required to register in a qualifying-year program before proceeding to the master's program.

The regulations governing the qualifying year are outlined in the General Regulations section of this Calendar.

#### Program Requirements

Students are required to complete 5.0 credits as follows:

\* Religion 34.500

\* 34.501

\* 34.502

\* 34.503

\* 34.599

34.501 and 34.502 must be taken in two different areas other than the student's thesis area. Seminars in other units may be substituted for 34.501 and 34.502 with permission of the department. The department particularly encourages students to consider Anthropology 54.543 (also listed as Religion 34.543) as a substitute for 34.501 or 34.502 if anthropology of religion is not their thesis area.

The student's program will be worked out in consultation with, and with the approval of, the department's supervisor of graduate studies and its committee on graduate studies. The prescribed program will take into account the student's background and special interests, as well as the research interests and competence of the staff.

### Deadlines

#### Thesis Proposal

Full-time students will normally submit their thesis proposal to the thesis proposal board by the end of the first month of their second term in the master's program.

#### Thesis

Regulations governing requirements for the master's thesis, including deadlines for submission, are outlined in the General Regulations section of this Calendar, Section 12.

### Guidelines for Completion of Master's Degree

Full-time students in the master's program are normally expected to complete all requirements within two years of entry into the program. Part-time students normally complete all requirements within five years of the date of entry into the program.

### Language Requirements

The student will be required to acquire, or to demonstrate that he/she already has, a reading knowledge of whatever language is essential to his/her research. Students are advised to consult the Supervisor of Graduate Studies for further regulations.

### Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the Registration Instructions and Class Schedule booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Religion 34.500T2

#### Graduate Seminar in Religion

A seminar on theories and methods in the study of Religion. Compulsory for M.A. students.

Religion 34.501F1, W1, S1

#### Directed Studies in Religion

Religion 34.502F1, W1, S1

#### Directed Studies in Religion

Religion 34.503T2, S2

#### Tutorial

A tutorial preparing the student in the general area of their thesis. Normally taken with the thesis supervisor.

Religion 34.543F1 or W1

**The Anthropology of Signs and Symbols**

Various theoretical and methodological approaches to the anthropology of signs and symbols, their internal workings, and their relationship to other aspects of social life. (Also listed as Anthropology 54.543)

Prerequisite: Permission of the Department.

Religion 34.599F4, W4, S4

**M.A. Thesis**

## Social Work

Dunton Tower 509  
Telephone: 520-5601  
Fax: 520-7496

### The School

**Director of the School,** Colleen Lundy

**Supervisor of Graduate Studies,** Roy Hanes

The School of Social Work, accredited by the Canadian Association of Schools of Social Work, offers a graduate program leading to the degree of Master of Social Work. Year I will normally be completed over two terms of full-time study. Year II will normally be completed over three terms or twelve months of full-time study. Part-time study is also offered. Year I will normally be completed over two to three years, and Year II will normally be completed over three to four years.

### Master of Social Work

The Master of Social Work program is based on an analytical and critical approach to social work practice, and to knowledge related to practice. The program examines the structural context of personal and social problems and of social work practice itself. The structural context refers to the interaction between individuals and the social, political, and economic dimensions of society. The program focuses on the development of social work practices that change the interactions between people and structural contexts. The curriculum is organized into three concentrations representing the foundations of social work practice: Direct Intervention with Individuals, Families and Small Groups; Social Administration and Policy; and Community Work and Social Development.

The orientation of the School explicitly includes approaches to social policy development and social change that involve working collaboratively with individuals, groups, and communities. Strong emphasis is placed on sensitivity to the individual, and on the development of new and innovative strategies for working with individuals in the context of their everyday lives. The School also stresses community work and social development that raises awareness of social problems that affect the lives of all people in our society. Analysis of the material conditions of life in Canadian society and the production of class, gender, and race is considered central to all aspects of the curriculum.

The School of Social Work is committed to educational equity. The society in which we live and of which social work is a constituent part is composed of groups of people distinguished by their differential access to power - economic, political, and social. The School af-

firms the principle that all these groups should have the opportunity to learn in a supportive environment. Educational equity is consistent with a continuing commitment to meeting high standards of academic and practice competence.

The central purpose of the graduate program is to provide students with the opportunity to build on their knowledge and experience. Students will be able to use the program to deepen their understanding of both the methods and contexts of practice, to build new knowledge, and to apply this new knowledge in a practical way. The program requirements are designed to be as flexible as possible while at the same time ensuring that all students master core social work knowledge and practice skills. Graduates may expect to use their experience in the School as the basis for continuing to expand their personal knowledge in a society undergoing rapid change.

### Admission Requirements

The School of Social Work provides two points of entry into the Master of Social Work program.

Applications are accepted to the first year of a two year M.S.W. program from candidates who hold an Honours bachelor's degree, or the equivalent, with at least high honours standing (normally B+ or better in honours subject; B- or better overall) in a discipline other than social work.

Applications are accepted to the one year M.S.W. program from candidates who hold an accredited Bachelor of Social Work degree with honours standing (normally B+, or better in honours subject; B- or better overall).

Applications are accepted to the one year M.S.W. program from candidates who are in the final year of a Bachelor of Social Work program, and who have maintained a B+ or better in social work and B- or better overall. Applicants with social work experience who hold undergraduate or graduate applied social science degrees from a university or other degree granting institution are directed to apply to the two-year M.S.W. program. The School will review the equivalence of such degrees to a Bachelor of Social Work.

Work experience in social work or a related field is considered as one of several selection criteria for both M.S.W. Year I and M.S.W. Year II.

Persons who have a Bachelor of Arts degree and human service experience may also wish to apply to the Bachelor of Social Work program. Please refer to the *Undergraduate Calendar* for further information.

Applicants must have completed 1.0 credit in research methods in their undergraduate program. The School of Social Work will not normally grant advanced standing for course work completed prior to entry into the M.S.W. program. Students accepted into M.S.W. Year I will be expected to complete 5.0 credits of course work in Year I and 6.0 credits of course work in Year II. Students accepted into M.S.W. Year II will be expected to complete 6.0 credits of course work. Work experience may not be substituted for research or other academic requirements, including the practicum.

Candidates must apply by December 1 for September admission.

## Part-Time Studies

The School offers part-time studies to a limited number of qualified candidates who cannot participate in a program of full-time study. The requirements for part-time studies are identical to those of the regular program except that part-time students are limited to a maximum of 1.0 credit of course work per term.

Students registered on a part-time basis must maintain continuous registration for a minimum of two terms per year until all course requirements are completed.

In their first fall term, part-time students in the M.S.W. Year I must register in Social Work 52.551 or 52.552 and one of 52.538, 52.548, or 52.568. Part-time students in the M.S.W. year II register in social work 52.535 plus an additional 0.5 credit of course work in their first fall term.

## Change of Status

Students contemplating changing their full-time or part-time status should consult the General Regulations section of the Graduate Calendar (see p.57.)

## Program Requirements

Students with an Honours undergraduate degree other than a B.S.W. or the equivalent who are admitted into the two-year M.S.W. program must complete Year I and Year II.

Students with a B.S.W. or equivalent who are admitted into the one-year M.S.W. program must complete Year II.

Year I of the M.S.W. consists of the following 5.0 credits:

- \* 52.538F1 or W1
- \* 52.548F1 or W1
- \* 52.568F1 or W1
- \* 52.551F1 or W1
- \* 52.552F1 or W1

\* 52.566F4 or W4 or S4

\* 0.5 credit to be taken from graduate-level course offerings in the School.

Year II of the M.S.W. consists of the following 6.0 credits:

\* 52.535 (or 52.536 and 52.537)

\* 52.545 (or 54.546 and 52.547)

And any of the following options:

*Thesis/Course Work Option*

52.599

2.0 credits of course work

*Thesis/Practicum Option*

52.599

52.567

*Research Essay/Course Work/Practicum Option*

52.593

52.567

1.0 credit of graduate level course work in social work

or

52.594 (0.5credit)

52.567

1.5 Credits Graduate level course work in Social Work

*Practicum/Course Work Option*

52.567

2.0 credits of course work

For all course options listed above, a minimum of 1.0 credit must be taken from graduate-level course offerings, in the School of Social Work, a maximum of 1.0 credit may be taken outside the School of Social Work, and a maximum of 0.5 credit may be taken at the 400-level.

All students in Social Work 52.593, 52.599, 52.566, 52.567 must maintain continuous registration until completion of the course in accordance with the General Regulations as stated in this calendar.

## Students in the Master's Program before 1995

The program requirements established on admission for students who were registered in the two-year M.S.W. program prior to 1995 continue to apply; however, negotiation of course offerings to satisfy program requirements will be established on an individual basis. Completion of a practicum and either a Thesis or an Independent Enquiry Project (Social Work 52.590) will continue to be required.

## Academic Standing

Candidates for the M.S.W. degree must complete all course work (or the equivalent) counted towards the degree with a grade of B- or better. The School of Social Work does not permit the C+ option.

## Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Note: All seminar courses, directed studies, workshops, independent study courses, and community practice courses are governed by Section 7.7, Tutorials, of the General Regulations.

## M.S.W. Year I - Required Courses

Social Work 52.538F1 or W1

### Direct Intervention

Presentation of a structural framework for social work theory and practice examining assessment and interventive approaches, analytical and interaction skills, helping process and social transformation. Explores interventions with individuals, families, small groups based on an understanding of class, gender, race, age, ability and sexual orientation. Precludes additional credit for Social Work 52.534.

Prerequisite: Registration in M.S.W. Year I.

Social Work 52.548F1 or W1

### Social Administration and Policy

Knowledge and skills required for understanding, analyzing and practicing social policy development and administration in social work. Political, economic, and social context of policy making, theoretical perspectives for developing policy, and contemporary social policy issues.

Precludes additional credit for Social Work 52.534.

Prerequisite: Registration in M.S.W. Year I.

Social Work 52.551F1 or W1

**Theories in Social Science and Social Work**  
Examines relationships between theories in social science and in social work exploring connections to social work practice and emphasizing theories of inequality.

Precludes additional credit for Social Work 52.550.

Prerequisite: Registration in M.S.W. Year I.

Social Work 52.552F1

**History of Social Welfare and Social Work**  
Historical development of social welfare policies and the Canadian welfare state. History of relationship of economy, family, welfare institutions and Canadian state. Focus on the origins and development of social work as a profession.

Precludes additional credit for Social Work 52.550.

Prerequisite: Registration in M.S.W. Year I.

Social Work 52.566F4, W4, S4

### Practicum I

Integration of academic and practical aspects of social-work education. 500 hours of guided learning in a community-based setting. Field seminar required.

Prerequisite: Registration in M.S.W. Year I, and completion of or concurrent registration in Social Work 52.538, 52.548, 52.551, 52.552, and 52.568.

Social Work 52.568F1 or W1

### Community Work

Models and methods of community organization. Social-economic contexts and ideological approaches to social change work; social change efforts; globalization and corporate rule.

## M.S.W. Year II - Required Courses and Program Options

Social Work 52.535T2

### Advanced Theory for Social Work Practice

Advanced theory of the intersection of practice in direct intervention, community work, and social administration and policy, from a perspective of a range of structural inequalities.

Prerequisite: Registration in M.S.W. Year II.

Social Work 52.536F1

### Advanced Theory for Social Work Practice

First half of 52.535T2.

Prerequisite: Registration in M.S.W. Year II.

Social Work 52.537W1

### Advanced Theory for Social Work Practice

Second half of 52.535T2.

Prerequisite: Registration in M.S.W. Year II.

Social Work 52.545T2

### Research and Evaluation in Social Work

Addresses the logic of enquiry, and assesses quantitative and qualitative techniques. Attention to program and direct intervention evaluation especially with the use of action and participatory research approaches. May include research or evaluation project with community agencies and practitioners, or individual research proposal.

Prerequisite: Registration in M.S.W. Year II.

Social Work 52.546F1

**Research and Evaluation in Social Work**

First half of 52.545T2.

Prerequisite: Registration in M.S.W. Year II.

Social Work 52.547W1

**Research and Evaluation in Social Work**

Second half of 52.545T2.

Prerequisite: Social Work 52.546.

Social Work 52.549W1

**Social Administration and Policy**

Second half of 52.540T2.

Prerequisite: Registration in M.S.W. Year II.

Social Work 52.560F4,W4,S4

**Practicum II**

500 hours integrating advanced social work theories and practice. Students are expected to build on and to develop beyond present knowledge and skills. Field seminar required. Not usually available in the first term of registration..

Prerequisites: Initial registration in the M.S.W. program in either 1995-96 or 1996-97.

Social Work 52.567F4,W4,S4

**Practicum II**

500 hours integrating advanced social work theories and practice. Field seminar required. Not usually available in the first term of registration.

Prerequisite: B.S.W. or completion of M.S.W. Year I, and completion or concurrent registration in Social Work 52.535.

Social Work 52.599F4,W4,S4

**Thesis**

Prerequisite: Registration in M.S.W. Year II.

**Optional Courses**

Social Work 52.506F1 or W1 or S1

**Social Work, Gender and the State**

This seminar course examines the construction of the "social" sphere and making the "social" work as it applies to the development of social welfare and the social work profession. An analysis of the gendered character of state provisions, women's participation in their formation, and their implications with regard to race and class is used to examine the current restructuring of social welfare.

Social Work 52.511F1 or W1 or S1

**Social Policy Analysis**

Conceptual, theoretical, and empirical tools for the analysis of social policies in Canadian society.

Social Work 52.512F1 or W1 or S1

**Political Economy of Health**

Distinctions and connections between health and health care. Who receives care, who provides it, who pays for it, and who makes the decisions affecting it.

Social Work 52.515F1 or W1 or S1

**Poverty and Income Security**

Examination of theories of poverty and wealth, conflicting understandings of poverty and the unequal distribution of income and wealth in Canada. Theories of poverty and wealth as they influence social policy, notably universal programs, social welfare services, income redistribution, and taxation.

Social Work 52.516F1 or W1 or S1

**Women and Social Policy**

Structural analysis of social policy affecting women. Relationship of feminist scholarship to the practical work of developing policy and to policy outcomes for women. Impact of the women's movement on the formal processes of policy making.

Social Work 52.518F1 or W1 or S1

**Seminar in Social Policy**

Social policy analysis of particular fields such as corrections, mental health services, children's services, or health care services. Current programs, historical developments, and the major current issues, developments, and challenges.

Social Work 52.527F1 or W1 or S1

**Community Economic Development**

Critical understandings of sustainable Community Economic Development (CED). Diverse local and international CED initiatives. Skills necessary for facilitating CED processes.

Social Work 52.531F1 or W1 or S1

**Women, Male Violence and Social Change**

Focus on male violence against women. Theory, responses of the state and the justice system, and practice approaches to helping women and the men who abuse them, as well as initiatives for social change.

Social Work 52.532F1 or W1 or S1

**Mental Health Policy and Practice**

Historical development, legislative framework, institutional and service structure, and practice issues related to mental health services in Canada. The interface between mental health and sexual abuse, family violence, racism, corrections, aging and immigration.

Social Work 52.539F1, W1, S1

**Foundations of Direct Intervention**

Philosophical and historical evolution of the competing paradigms underlying contemporary social work practice, with individuals, families, and community analyzed using philosophy of science and the sociology of knowledge.

Social Work 52.553T2,F2,W2,S2

**Directed Studies - Group**

Exploration of selected theoretical perspectives relevant for social work practice that are offered subject to the availability of faculty. Arranged for small groups of students who are interested in a similar substantive area.

Social Work 52.554T2,F2,W2,S2

**Directed Studies - Individual**

Individual exploration of selected theoretical perspectives for social work practice under the direct supervision of a member of faculty or visiting scholar.

Social Work 52.555F1,W1,S1

**Directed Studies - Group**

Exploration of selected theoretical perspectives relevant for social work practice that are offered subject to the availability of faculty. Arranged for small groups of students who are interested in a similar substantive area.

Social Work 52.556F1,W1,S1

**Directed Studies - Individual**

Individual exploration of selected theoretical perspectives for social work practice under the direct supervision of a member of faculty or visiting scholar.

Social Work 52.557F1,W1,S1

**Workshop on Selected Topics in Social Work Practice**

Approved workshops organized in the School and in the community may be offered subject to the availability of faculty. Evaluation of students is based on the student's role in the workshop and the nature of the assignment(s) required of the student.

Social Work 52.558T2,F2,W2,S2

**Studies in Social Work**

May combine directed studies - group or individual - workshops, research study, or community practice. Registration is by permission of the supervisor of graduate studies and will be granted only when the student has negotiated an approved study agreement with the social work instructor(s).

Social Work 52.559F1,W1,S1

**Studies in Social Work**

May combine directed studies - group or individual - workshops, research study, or community practice. Registration is by permission of the supervisor of graduate studies and is granted only when the student has negotiated an approved study agreement with the social work instructor(s).

Social Work 52.569F1,W1,S1

**Studies in Community Practice**

May be offered subject to the availability of faculty. Studies are supervised by faculty. A written proposal is required that must include learning objectives, practice objectives, time of completion, and criteria and method of evaluation.

Social Work 52.570F1,W1,S1

**Special Topics in Social Work**

The School will offer lecture courses on substantive topics related to social work and social welfare. Topics will vary each year depending on the interests of faculty and stu-

dents. Students from outside the School of Social Work may register with permission of the School.

Social Work 52.571F1,W1,S1

**Special Topics in Social Work**

The School will offer lecture courses on substantive topics related to social work and social welfare. Topics will vary each year depending on the interests of faculty and students. Students from outside the School of Social Work may register with permission of the School.

Social Work 52.572F1,W1,S1

**Special Topics in Social Work**

The School will offer lecture courses on substantive topics related to social work and social welfare. Topics will vary each year depending on the interests of faculty and students. Students from outside the School of Social Work may register with permission of the School.

Social Work 52.573F1,W1,S1

**Special Topics in Social Work**

The School will offer lecture courses on substantive topics related to social work and social welfare. Topics will vary each year depending on the interests of faculty and students. Students from outside the School of Social Work may register with permission of the School.

Social Work 52.574F1 or W1 or S1

**Race, Culture and Social Work Practice**

Anti-racist framework for social work practice to analyze policy and practice issues. "Privilege" as a critical and essential component for understanding oppression based on race and culture. Complex intersections of race and culture with class, gender, age, and other dimensions.

Social Work 52.575F1 or W1 or S1

**Child Protection Policies and Interventions**

Explores child welfare policy and the organization of social work practice particularly in the Canadian context. A range of welfare provisions affecting children and families will be considered as will direct child protection policies.

Social Work 52.581F1 or W1 or S1

**Social Work Practice Seminar: Feminist Social Work Practice with Individuals, Couples, and Families**

Theory and practice of feminist approaches to social work with individuals, couples and families. Issues of diversity, such as race and class, as well as gender. Problem-based learning approach.

Social Work 52.582F1 or W1 or S1

**Social Work Practice Seminar: Cross-cultural Studies of the Self and Related Subjects**

Governance and care of the Self in different cultural and historical contexts. Theoretically located in emergent sociology and psychology of governance and care of the self. Cross-cultural perspectives practices and policies of different forms of governance and debates about social regulation.

Social Work 52.584F1 or W1 or S1

**Social Work Practice Seminar: Organizing for Social Change**

Hands-on introduction to theories, models, and methods of organizing for social change from grass roots groups to national coalitions. Practical skills for helping people mobilize to influence relevant social issues. Problem-based learning approach.

Social Work 52.585F1 or W1 or S1

**Social Work Practice Seminar: Social Development in the International Context**

International social development policies and practices from a cross-cultural perspective. Focus on international social policies and practices, and on economic, health, telecommunication, migration, and education policies and practices.

Social Work 52.583F1, W1, S1

**Social Work Practice Seminar**

Applied knowledge for social work practice utilizing "problem-based learning". Examples drawn from the experience of social work practitioners. Self-guided individual and group study, directed by a faculty tutor.

Social Work 52.586F1, W1, S1

**Social Work Practice Seminar**

Applied knowledge for social work practice utilizing "problem-based learning". Examples drawn from the experience of social work practitioners. Self-guided individual and group study, directed by a faculty tutor.

Social Work 52.587F1, W1, S1

**Social Work Practice Seminar**

Applied knowledge for social work practice utilizing "problem-based learning". Examples drawn from the experience of social work practitioners. Self-guided individual and group study, directed by a faculty tutor.

Social Work 52.588F1, W1, S1

**Social Work Practice Seminar**

Applied knowledge for social work practice utilizing "problem-based learning". Examples drawn from the experience of social work practitioners. Self-guided individual and group study, directed by a faculty tutor.

Social Work 52.589F1, W1, S1

**Social Work Practice Seminar**

Applied knowledge for social work practice utilizing "problem-based learning". Examples drawn from the experience of social work practitioners. Self-guided individual and group study, directed by a faculty tutor.

Social Work 52.590F2, W2, S2

**Independent Enquiry Project**

This course is available only for those students registered in the previous two-year program. (See 1993-94 *Graduate Calendar* or consult the School for description).

Social Work 52.593T2, F2, W2, S2

**Independent Research Studies in Social Work**

Individually-arranged independent research study. Requires a written proposal that outlines a research project with clear learning objectives, and practice objectives (where relevant).

Social Work 52.594, F1, W1, S1

**Independent Research Studies in Social Work**

Individually-arranged independent research study. Requires a written proposal that outlines a research project with clear learning objectives, and practice objectives (where relevant).

Social Work 52.599 F4, W4, S4

**Thesis**

Prerequisite: Registration in MSW Year II.

# Sociology and Anthropology

Loeb Building B742  
Telephone: 520-2582  
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## The Department

**Chair of the Department,** To be announced

**Coordinator of Graduate Programs in Sociology,** D. Forcese

**Coordinator of the Graduate Program in Anthropology,** J. Chevalier

The Department of Sociology and Anthropology offers programs of advanced study and research leading to the M.A. and the Ph.D. degrees in Sociology, and the M.A. in Anthropology.

The principal focus of the graduate programs in sociology is the organization and development of contemporary societies in comparative context and with particular reference to Canadian society. Specializations in theory and methodology, social stratification and power, cultural and gender studies, and in comparative institutions are offered.

The anthropology program focuses on the social and cultural other, including its popular and scholarly representations, through current emphasis on three program concentrations:

- \* the anthropology of signs and symbols
- \* North American native studies
- \* the anthropology of development and underdevelopment.

The department strives to achieve a blend of research and formal graduate instruction in its graduate programs.

## Qualifying-Year Program

Applicants with general (3 year) bachelor's degrees may be admitted into a qualifying-year program designed to raise their standing to honours status. Students earning at least high honours standing in their qualifying-year courses will be considered for admission into the master's program.

Refer to the General Regulations section of this Calendar for details of the regulations governing the qualifying year.

## Master of Arts in Sociology

### Admission Requirements

The requirement for admission into the master's program is a B.A.(Honours) (or the equivalent) with at least high honours standing. Where relevant, previous professional experience will

be taken into account in determining an applicant's standing on admission.

The deadlines for submitting applications and supporting documents for graduate study in sociology are as follows: February 1 for students requesting financial assistance; July 1 for students not requesting financial assistance but who are seeking admission in September; and November 1 for students who are seeking admission in January.

## Program Requirements

Master's students in sociology are required to select and follow one of the optional program patterns below, chosen in consultation with a graduate adviser:

### Thesis Program

\* 3.0 credits. Under certain circumstances one of the courses may be selected from those offered at the senior undergraduate level. Sociology 53.505 and 53.589 are highly recommended, especially for students who at the time of registration have not decided on a thesis topic.

\* A thesis equivalent to 2.0 credits

\* An oral examination on the candidate's thesis and program

### Research Essay Program

\* 4.0 credits. Under certain circumstances one of the courses may be selected from those offered at the senior undergraduate level. Sociology 53.589, is highly recommended, especially for students who at the time of initial registration have not decided on a research topic

\* A research essay equivalent to 1.0 credit

\* An oral examination on the candidate's research essay and program

### Course Work Program

\* 5.0 credits excluding Sociology 53.595. Under certain circumstances one of the courses may be selected from those offered at the senior undergraduate level

\* Written and oral comprehensive examination in the candidate's area of specialization and program

## Concentration in Quantitative Methodology

Students in either the research essay or thesis program options may pursue a concentration in quantitative methodology. For a concentration in quantitative methodology courses selected must include the following:

\* Sociology 53.505

\* Sociology 53.589

\* At least 1.0 credit selected from: Sociology 53.511; 53.512; 53.513; 53.514; 53.515; 53.521; 53.565

\* At least 1.0 credit in sociology at the graduate level (not including those listed above)

Students in the Concentration in Quantitative Methodology may apply for admission into a Cooperative Education option. This option provides an opportunity for students to enhance their educational experience through a work placement directly related to their area of interest and expertise. Once admitted into this option, students shall enroll in 53.597. The conditions of the placement are arranged with the student's supervisor and the graduate coordinator. Grades for the cooperative education placement are assigned in consultation between the placement supervisor and the graduate coordinator. Placements can be held for up to two academic terms and count for 1.0 credit.

### Transfer from Thesis to Course Work M.A.

Students who choose to change from the thesis to the course work program must normally do so before registering for a third term after initial, full-time registration, or before registering for a fifth term after initial part-time registration.

### Academic Standing

A grade of B- or better must normally be obtained in each credit counted toward the master's degree. With the recommendation of the department, and permission of the Dean of the Faculty of Graduate Studies and Research, a candidate may be allowed a grade of C+ in 1.0 credit.

### Master of Arts in Anthropology

#### Admission Requirements

The requirement for admission into the master's program is a B.A. (Honours) (or the equivalent) with at least high honours standing. Where relevant, previous professional experience will be taken into account in determining an applicant's standing on admission.

The deadlines for submitting applications and supporting documents for graduate study in anthropology are as follows: February 1 for students requesting financial assistance; July 1 for students not requesting financial assistance but who are seeking admission in September; and November 1 for students who are seeking admission in January.

### Program Requirements

Master's students in anthropology are required to select and follow one of the optional program patterns below, chosen in consultation with a graduate adviser:

#### Thesis Program

3.0 credits to include:

\* Anthropology 54.541 (normally to be taken in the first fall term after admission to the program)

\* Anthropology 54.542

\* 2.0 additional credits selected from the anthropology graduate course offerings; from courses offered in the sociology graduate program (especially in theory and methods, or in areas which relate to the student's thesis research interests); from 400-level courses offered in the sociology and anthropology undergraduate program (with permission of the graduate committee); or any combination of these selected in consultation with the student's graduate adviser. Courses in other programs in the University may also be selected, especially if they relate to the student's proposed thesis research, but normally not in excess of 1.0 credit

\* A thesis equivalent to 2.0 credits

\* An oral examination on the candidate's thesis and program

#### Course Work Program

5.0 credits excluding Anthropology 54.595, consisting of:

\* Anthropology 54.541 (normally to be taken in the first fall term after admission to the program)

\* Anthropology 54.542

\* 4.0 additional credits as described in the thesis program above, chosen in consultation with the student's graduate adviser

\* A written and oral comprehensive examination in the candidate's area of specialization and program

### Transfer from Thesis to Course Work M.A.

Students who choose to change from the thesis to the course work program must normally do so before registering for a third term after initial, full-time registration, or before registering for a fifth term after initial part-time registration.

### Academic Standing

A grade of B- or better must normally be obtained in each credit counted toward the master's degree. With the recommendation of the

department, and permission of the Dean of the Faculty of Graduate Studies and Research, a candidate may be allowed a grade of C+ in 1.0 credit or each of two 0.5 credits.

## Doctor of Philosophy in Sociology

The substantive focus of the Ph.D. program is the organization and development of contemporary societies, both in a comparative context and with particular reference to Canadian society.

The Ph.D. program in sociology normally will be undertaken on a full-time basis; however in exceptional cases the department will consider admission on a part-time basis.

## Admission Requirements

The minimum requirement for admission into the Ph.D. program is a master's degree (or the equivalent) in sociology, normally with a minimum average of B+ in courses (including the thesis where applicable), and with no grade below B.

Applicants who have deficiencies in certain areas may be admitted to the Ph.D. program, but will normally be required to complete additional course work.

The deadlines for submitting applications and supporting documents for admission into the Ph.D. program in sociology are as follows: February 1 for students requesting financial assistance; July 1 for students not requesting financial assistance but who are seeking admission in September; and November 1 for students who are seeking admission in January.

## Program Requirements

The specific program requirements of the Department of Sociology and Anthropology are the following:

- \* 10.0 credits including Sociology 53.600, and a thesis equivalent to a maximum of 7.0 credits or a minimum of 5.0 credits
- \* Written and oral comprehensive examinations in three areas of specialization
- \* Presentation of a thesis proposal
- \* Language requirements as stated below
- \* An oral defence of the thesis

## Comprehensive Examinations

Each Ph.D. candidate is required to write comprehensive examinations in three of the following areas:

- \* Theory and Methodology
- \* Stratification and Power

- \* Cultural Studies
- \* Applied Social Research

At least one but not all three of the examinations must be in the area of stratification and power.

Subjects of instruction and research subsumed under these four areas are:

### *Theory and Methodology*

- \* Logic of Social Scientific Enquiry
- \* Classical Social Theories
- \* Contemporary Social Theories
- \* Feminist Theories
- \* Research Methods (Historical, Qualitative, and Quantitative)

### *Stratification and Power*

- \* Occupations, Organizations, and the Labour Process
- \* Class Analysis and Social Stratification
- \* Political Sociology
- \* Race and Ethnic Relations
- \* Gender Relations
- \* Political Economy
- \* Canadian Society
- \* Social and Economic Development
- \* Citizenship Studies
- \* Governance, Regulation, and Law

### *Cultural Studies*

- \* Communication and Popular Cultures
- \* Ethnographic Analysis
- \* Discourse Analysis
- \* Social Anthropology
- \* Social and Virtual Spaces

### *Applied Social Research*

- \* Criminal Justice
- \* Health and Illness Policy
- \* Population Studies
- \* Sociology of Language
- \* Built Environments
- \* Education Policy

Upon petition to the sociology graduate program's coordinator, an approved field in sociology or a related discipline may be substituted for one of the options above. The subjects of instruction and research subsumed under each of the areas are indicative, and

may be subsumed under more than one area, depending on the analytic approach adopted.

The comprehensive examinations are to be completed after course requirements for the Ph.D. have been completed. Normally comprehensive examinations must be completed no later than two years or six terms after initial full-time registration, and four years or twelve terms after initial part-time registration.

The thesis proposal is to be presented after comprehensive requirements have been completed. Normally the thesis proposal must be presented no later than two and one-half years or seven terms after initial full-time registration and five years or fifteen terms after initial part-time registration.

## Language Requirement

The Department of Sociology and Anthropology requires each Ph.D. candidate to demonstrate an understanding of a language other than English. Although French is the preferred second language, students may be permitted to substitute another language if it is demonstrably relevant to their professional interests. It is strongly advised, however, that all English-speaking candidates be proficient in French. The language requirements may be satisfied by a demonstration of reasonable understanding, on sight, of material contained in selected samples of sociological literature in that language. Students may find it necessary or advisable to take a course in the required language before undertaking the departmental language examination.

## Academic Standing

Candidates must obtain a grade of B- or better in each credit, and *Satisfactory* on the comprehensive examinations, the Ph.D. thesis and its oral defence.

## Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.

FW,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Sociology 53.500F1 or W1

### Classical Sociological Theory

Crucial sociological concepts and ideas by the founders of sociology. Attention will be given to Marx, Weber, Durkheim, Pareto, Comte, and Husserl.

Sociology 53.501F1 or W1

### Selected Topics in Classical Theory

Topic varies from year to year.

Students should check with the Department regarding the topic offered.

Sociology 53.502F1 or W1

### Contemporary Sociological Theory

Major theoretical perspectives in sociology, including social behaviourism; social action theories such as symbolic interactionism, phenomenological sociology, ethnomethodology; and structuralist theories such as structural functionalism, neo-Marxism and critical theory.

Sociology 53.503F1 or W1

### Selected Topics in Contemporary Theory

Topic varies from year to year.

Students should check with the Department regarding the topic offered.

Anthropology 54.504F1 or W1

### Ecological Anthropology

Anthropological approaches to the study of human environmental relationships and to current problems of ecological degradation affecting native societies around the world.

Sociology 53.505F1

### Recurring Debates in Social Thought

Recurring issues and debates in the discipline. Topics such as the nature of social science; the objective world versus social construction; questions of evidence, meaning and measurement; agency versus structure; the relation between research and praxis; knowledge and power, may be considered.

Prerequisite: The course is restricted to M.A. students in sociology. Others may be admitted by permission of the Department.

Sociology 53.507F1 or W1

### Social Change and Economic Development

Critical examination of studies of change and development in historical and contemporary national and transnational systems.

Sociology 53.509F1 or W1

### Philosophy of Social Science I

Philosophy of language and the basic elements of scientific method, such as the classification of the sciences, the concepts of value, cause and probability, induction and deduction, confirmation of hypotheses, and the concept of truth.

Sociology 53.511T2

### Research Design and Data Analysis

An integrated approach to the problems involved in the analysis of quantitative data, research design and procedures.

Sociology 53.512F1 or W1

**Statistical Methods I**

A course on multiple regression analysis, with a review of basic statistical assumptions and techniques, followed by a detailed discussion of multiple regression analysis as a statistical technique.

Sociology 53.513F1 or W1

**Statistical Methods II**

The focus will be advanced research methods. Topics will include distributions, sampling distributions, hypothesis testing, and non-parametric methods. There will be an introduction to multivariate techniques, including regression and loglinear models.

Sociology 53.514F1 or W1

**Multivariate Analysis**

This course provides advanced instruction in methods and statistics. Consideration will be given to multiple regression, factor analysis, canonical analysis.

Sociology 53.515F1 or W1

**Selected Topics in Social Research**

Topic varies from year to year. Students should check with the Department regarding the topic offered.

Anthropology 54.516F1 or W1

**North American Native Studies**

An examination of selected issues in Canadian Indian, Inuit, and Métis history. The course will explore debates over social change, cultural autonomy, native rights, and government policy.

Anthropology 54.517F1 or W1

**Problems in North American Ethnohistory**

Methodological and substantive problems in the history of Canadian native peoples. Controversies concerning the impact of European penetration and colonial policies on inter-tribal relations, cultural identity, and other aspects of native life will be explored.

Anthropology 54.519F1 or W1

**Development, Dependency and Gender**

Varieties of "development" and "dependency" theories, and feminist critiques of both, in analyzing gender relations in the Third and Fourth Worlds.

Sociology 53.520F1 or W1

**Comparative Social Systems**

Perspectives and research procedures employed by sociologists in the systematic and explicit comparison of data from two or more societies.

Sociology 53.521F1 or W1

**Comparative Methods in Social Research**

Current analytical problems and applications of comparative methods in social research. Students are expected to participate in a group research project in which one or more of these methods will be applied.

Anthropology 54.522F1 or W1

**The Anthropology of Underdevelopment**

Analysis of theoretical and historically concrete issues in the study of variable economic systems ranging from domestic subsistence and peasant production to slavery and capital-dominated markets.

Sociology 53.524F1 or W1

**Consuming Passions: The Regulation of Consumption, Appearance and Sexuality**

Examination of the rise of consumption and private pleasures and their regulation and self-regulation. (Also listed as Law 51.508)

Sociology 53.525T2

**Canadian Society**

A critical examination of sociological models of modern societies and their relevance to Canada.

Sociology 53.526F1 or W1

**Sociology of Occupations and Professions**

A consideration of the development of occupational recruitment patterns and manpower problems in developed and developing areas.

Sociology 53.527F1 or W1

**Sociology of Formal Organizations**

A consideration of the forms and processes of bureaucracy in modern society, government and industry.

Sociology 53.529F1 or W1

**Sociology of Science and Technology**

Study of the interaction among science, technology and change in modern societies.

Sociology 53.530F1 or W1

**Social Institutions I**

Topic varies from year to year. Students should check with the Department regarding the topic offered.

Sociology 53.531F1 or W1

**Social Institutions II**

Topic varies from year to year. Students should check with the Department regarding the topic offered.

Sociology 53.532F1 or W1

**The Labour Process**

A consideration of the organization of work and production from feudal times to the present. The purpose of the course is to analyze the labour process in advanced capitalist societies by means of the historical comparative method.

Sociology 53.533F1 or W1

**Sociology of Education**

The relations between education and other social institutions, the structure of educational opportunity, educational systems and organizations, and the sociology of learning.

Sociology 53.536F1 or W1

**Cultural Studies**

The relations between cultural practices and other social practices in definite social formations. Discussions are grounded through the choice of specific Canadian research on topics such as media, art, music, education, pedagogy, etc.

Sociology 53.537F1 or W1

**Psychoanalysis and Cultural Studies**

This course will examine the relationship between psychoanalytic and sociological theory. A particular focus will be on the work of feminist theorists.

Anthropology 54.538F1 or W1/Sociology 53.538F1 or W1

**Feminist Analyses**

This course surveys topics of current theory and research in recent feminist analysis. Both anthropological and sociological literature will be used.

Sociology 53.539F1 or W1

**Cultural Theory**

A survey of developments in European and North American Marxist and Post-Marxist cultural theories of the past quarter century.

Sociology 53.540F1 or W1

**Political Sociology**

An examination of theoretical and empirical work on selected aspects of the state, politics and political behaviour, primarily in North America and Europe.

Anthropology 54.541F1

**Proseminar in Anthropology I**

Anthropology as it is currently practiced at Carleton University, with a special emphasis on the anthropology of signs and symbols, North American native studies, development and underdevelopment. Required of all students during the first fall term they are in residence.

Anthropology 54.542W1

**Proseminar in Anthropology II**

Issues in the design and conduct of anthropological inquiry especially concerning proposed thesis research such as analysis of ethnographic material and development of explanatory frameworks prevailing in the discipline.

Prerequisite: Completion of Anthropology 54.541F1 or permission of the Department.

Anthropology 54.543F1 or W1

**The Anthropology of Signs and Symbols**

Various theoretical and methodological approaches to the anthropology of signs and symbols, their internal workings, and their relationship to other aspects of social life. (Also listed as Religion 34.543)

Sociology 53.544F1 or W1

**Race, Ethnicity and Class in Contemporary Societies**

Various theoretical approaches concerning the persistence and re-emergence of ethnic and/or racial groups are examined. Particular emphasis is given to the intersection and overlap of ethnicity and race with social class.

Sociology 53.545F1 or W1

**Power and Stratification**

An examination of theories of elite behaviour, social class, and ideology.

Anthropology 54.548

Sociology 53.548F1 or W1

**Feminism and Materialism**

An examination of recent attempts to develop feminist materialist theory and analyses. Substantive areas may include: the gender division of labour; family and economy; gender and class; gender, race and ethnicity; sexuality; reproduction; theory and politics.

Sociology 53.549F1 or W1

**The Politics of Social Movements and the State**

Origins, ideologies, strategies and political implications of social and popular movements in North America and Western Europe. Attention is given to the peace, feminist, gay, ecology, and anti-racist movements, as well as to the emergence of the New Right.

Sociology 53.550F1 or W1

**Gender Formation and State Formation**

The role of states in the formation of gender relations, in the context of class and race, and the production of gender as an aspect of state formation. The various levels of the state are conceived as both a site and object of gender politics.

Sociology 53.554F1, W1 or S1

**Selected Problems in Political Economy I**

A selected topic from current research in political economy. As the topic varies from year to year, students should check with the Department regarding the current offering. (Also listed as Political Economy 44.551 and Political Science 47.551)

Sociology 53.555F1, W1 or S1

**Selected Problems in Political Economy II**

A selected topic from current research in political economy. As the topic varies from year to year, students should check with the Department regarding the current offering. (Also listed as Political Economy 44.552 and Political Science 47.552)

Sociology 53.560F1 or W1

**Critical Discourse Analysis**

Examination of the relations between discourse, social semiotics, extradiscursive semiotics and social organization.

Sociology 53.565F1 or W1

**Demographic Analysis**

Intensive study of analytical strategies and techniques employed in demographic research. Attention is also given to mathematical and statistical models used in demography, which are relevant to research in other areas of sociology.

Sociology 53.566F1 or W1

**Selected Topics in Sociology**

Topic varies from year to year.

Students should check with the Department regarding the topic offered.

Sociology 53.567F1 or W1

**Contemporary Theories of Crime and Social Regulation**

Recent developments in theories of criminality and social regulation. Particular reference will be made to the regulatory mechanisms of both public and private spheres within legal institutions, corrections, economic institutions, and the family.

Sociology 53.568F1 or W1

**Women and Work**

Issues concerning women and work, such as housework, occupational segregation, part-time work, the changing economic structure of work, wage inequality, and state policies with respect to childcare, equal pay and work of equal value, and affirmative action.

Sociology 53.577F1 or W1

**Crime, Social Control and Social Change**

An examination of the role of the discourses and ideologies surrounding crime, criminal processes, and social change. Topics may include such issues as juvenile justice, victimization, corporate crime, criminalization of indigenous peoples, substance use and abuse

Sociology 53.582F1 or W1

**Departmental Seminar**

Topic varies from year to year.

Students should check with the Department regarding the topic offered.

Sociology 53.583F1 or W1

**Critical Theory**

Recent developments in critical theory based upon its initial formulation by the Frankfurt School, with emphasis upon particular contemporary theories in a given year, e.g., J. Habermas, H. Willems, etc.

Sociology 53.584F1 or W1

**Modern Marxist Theory**

An examination of topics of theory and research in modern Marxist literature; the central focus is on problems of class analysis, the state, and politics in advanced capitalist societies.

Sociology 53.585F1 or W1

**Selected Topics in Sociology**

Topic varies from year to year.

Students should check with the Department regarding the topic offered.

Sociology 53.586F1 or W1

**Selected Topics in Sociology**

Topic varies from year to year.

Students should check with the Department regarding the topic offered.

Anthropology 54.587F1 or W1

**Selected Topics in the Anthropology of Signs and Symbols**

Topic varies from year to year.

Students should check with the Department regarding the topic offered.

Anthropology 54.588F1 or W1

**Selected Topics in North American Native Studies**

Topic varies from year to year.

Students should check with the Department regarding the topic offered.

Sociology 53.589F1 or W1

**The Logic of the Research Process**

An examination of the research process, including the phases of conceptualization, choice of indicators, sampling, data collection, and analysis. Published articles will be studied as exemplars of the range of possible research strategies.

Anthropology 54.589F1 or W1

**Selected Topics in the Anthropology of Development and Underdevelopment**

Topic varies from year to year.

Students should check with the Department regarding the topic offered.

Sociology 53.590F1, W1, S1

**Tutorial**

Anthropology 54.590F1, W1, S1

**Tutorial**

Sociology 53.595F4, W4, S4

**Course Work Comprehensive in Sociology**

Available for students in a course work M.A. who by the third term in their M.A. program have not yet completed their written and oral examinations. Completion of this course does not reduce the formal requirement of 5.0 credits.

Anthropology 54.595F4, W4, S4

**Course Work Comprehensive in Anthropology**

Available for students in a course work M.A. who by the third term in their M.A. program have not yet completed their written and oral examinations. Completion of this course does not reduce the formal requirement of 5.0 credits.

Anthropology 54.596F1, W1, S1

**Field Seminar**

This course is concerned with the conduct of directed field research, by special arrangement (for individuals or groups), to be combined with readings and papers under the supervision of a faculty member. The course may normally be taken only once in a student's program.

Sociology 53.597F1, W1, S1

**Placement in Sociology**

This course is required for students in the Concentration in Quantitative Methodology who have been admitted into the Cooperative Education option. This option provides an opportunity to enhance educational experience through work placement.

Anthropology 54.597F1, W1, S1

**Placement in Anthropology**

This course offers an opportunity to earn academic credit by engaging in research activities under the supervision of professional researchers in museums, government departments, non-governmental organizations, or other professional research settings. Placement research must be related to the preparation of the master's thesis.

Sociology 53.598F2, W2, S2

**M.A. Research Essay**

Students may enrol in this course for a maximum of three consecutive terms of study, including one summer term. Students must enrol in this course not later than the beginning of the second full year of study.

Sociology 53.599F4, W4, S4

**M.A. Thesis**

Anthropology 54.599F4, W4, S4

**M.A. Thesis**

Sociology 53.600T2

**Doctoral Seminar**

An in-depth study of current research in sociology including an enquiry into research techniques, conceptualization and attendant theoretical issues. This course is required of all first-year doctoral students in sociology.

Sociology 53.601F1 or W1

**Selected Topics in Sociology**

*Topic varies from year to year.*

Students should check with the Department regarding the topic offered.

Sociology 53.690F1, W1, S1

**Tutorial**

Sociology 53.699F, W, S

**Ph.D. Thesis**

# Systems and Computer Engineering

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## The Department

**Chair of the Department,** R.A. Goubran

**Associate Chair for Graduate Studies,**  
S. Majumdar

**Director, Telecommunications Technology  
Management Program,** A.J. Bailetti

**In addition to University and Graduate Faculty regulations, all Engineering departments share common procedures that are described in Section 18 of the General Regulations (see p.69).**

The Department of Systems and Computer Engineering has a large and active graduate program. We offer four graduate programs of study:

- \* M.Eng. in Electrical Engineering
- \* M.Eng. in Telecommunications Technology Management
- \* M.Sc. in Information and Systems Science
- \* Ph.D. in Electrical Engineering.

In addition, certain faculty members in the department are members of the Ottawa-Carleton Institute for Computer Science which offers a program leading to the M.C.S. degree. This program is more fully described on p. 137 of this Calendar.

The programs are described in more detail below.

## Fields of Research and Study

Research in the Department centres upon the analysis and design of engineering systems which process and transmit information and have computers as components. Within this context, several interrelated areas of study receive major attention:

### *Communication Systems*

- \* Broadband, ATM, and Multimedia Networks
- \* Wireless Data Networks
- \* Portable and Mobile Communication Systems
- \* Signal Processing
- \* Network Management
- \* Software Methods
- \* Coding and Information Theory

### *Computer Systems*

- \* CAD/CASE of Software and Systems
- \* Real-Time and Distributed Computing
- \* Software Engineering
- \* Object-Oriented Systems
- \* Design and Management of Distributed Application Systems
- \* Computer Resource Management
- \* Modelling of Client-Server Systems
- \* Data Base Systems
- \* Knowledge-based Systems
- \* Image Processing Systems
- \* Signal Processing Systems
- \* Robotic Systems
- \* Control Systems

### *Analysis Techniques*

- \* Modelling and Simulation
- \* Performance Analysis
- \* Optimization

### *Management of Engineering Processes*

- \* Management of Design Systems
- \* Software Project Management
- \* Business and Technology Opportunities
- \* Integrated Product Development

Course work provides students with the fundamental material and allows specialization in one or more of the above areas as desired. Thesis topics include both theoretical studies and the related problems of practicable realizations.

## Industrial Connections

The Department is a member of several Centres of Excellence:

- \* The Canadian Institute for Telecommunications Research
- \* Communications and Information Technology Ontario (CITO) (this replaces the older Telecommunications Research Institute of Ontario of which we were founding members).
- \* TeleLearning Network (TLN), a National Centre of Excellence.

Current research areas of the centres with major participation from the Departments are: broadband ISDN access networks, transmission methods for ISDN, methods for telecom-

munications software, mobile and portable wireless networks, VLSI in communications and network management using artificial intelligence methods, and wireless indoor digital communications.

Full advantage is taken of the technology-oriented industry-government-university complex in the Ottawa area. Co-operative projects are in progress with Nortel, Newbridge, Mitel, Stentor, the Department of Communications, Communications Research Centre, NRC, Bell Canada and the Department of National Defence. We are also involved in the Research Program in Managing Technological Change (MATCH), which is of particular interest to students in the M.Eng. in Telecommunications Technology Management.

## Research Facilities

The Department has an excellent collection of facilities for advanced research in systems and computer engineering. There are about 100 engineering workstations, primarily SUN, but also NT and other types, on an Ethernet local area network, multiprocessor target systems, and many other stand-alone and networked workstations. The network is part of the Internet and so has access to the World Wide Web, electronic mail, network news, and much public domain research software. There are also numerous high-end PCs and Macintosh computers, many equipped for desktop video conferencing.

Software includes all of the standard programming and AI languages, symbolic algebra systems, wordprocessors, and various packages specific to telecommunications, signal processing, performance analysis, software engineering, and other areas of research.

The communications and image and signal processing labs provide state-of-the-art test, measurement, and prototyping facilities which include radio transmission and test equipment (up to EHF frequencies), co-processor boards, audio equipment, data acquisition hardware, interactive video conferencing lab equipment, robots, etc.

The main research laboratories include the following:

- \*Broadband Networks
- \*Digital Signal Processing
- \*Image Processing
- \*Internet System Software Performance
- \*Managing Technological Change
- \*Mobile and Portable Communications
- \*Network Management and Artificial Intelligence

\*Personal Communication Systems

\*Radio Communications

\*Real-Time and Distributed Systems

\*Robotics, Automation, and Control

\*TeleLearning

## Master of Engineering in Electrical Engineering

The M.Eng in Electrical Engineering is offered through the Ottawa-Carleton Institute for Electrical and Computer Engineering (OCIECE) which is jointly administered by the Department of Systems and Computer Engineering and the Department of Electronics at Carleton University, and the School of Information Technology and Engineering at the University of Ottawa. For further information about the M.Eng. in Electrical Engineering, including admission and program requirements, please see the OCIECE information beginning on p. 158.

The M.Eng. is also available as part of ConGESE (Consortium for Graduate Education in Software Engineering), a collaborative program offering a specialization in software engineering. This program is geared towards software professionals working for participating industrial partners. The ConGESE program imposes further regulations and requirements on the existing program. The degree awarded will in each case specify the discipline of the participating unit with specialization in software engineering. Additional information is available from the graduate supervisor.

## Doctor of Philosophy in Electrical Engineering

The Ph.D. in Electrical Engineering is offered through the Ottawa-Carleton Institute for Electrical and Computer Engineering (OCIECE) which is jointly administered by the Department of Systems and Computer Engineering and the Department of Electronics at Carleton University, and the School of Information Technology and Engineering at the University of Ottawa. For further information about the Ph.D. in Electrical Engineering, including admission and program requirements, please see the OCIECE information beginning on p. 158.

## Master of Science in Information and Systems Science

The M.Sc. in Information and Systems Science is specifically designed for those who do not have a background in electrical engineering or computer science. This program is offered in cooperation with the School of Computer Science and the School of Mathematics and Statistics at Carleton University. Please see p. 209 for details.

## Master of Engineering in Telecommunications Technology Management

The Department of Systems and Computer Engineering offers a program of study and research leading to the degree of Master of Engineering in Telecommunications Technology Management.

The objective of the program is to train engineers and computer scientists to become competent and efficient managers of the engineering processes that deliver innovative telecommunications systems, products, and services. The emphasis is on design, development, manufacture, and technical support, areas for which engineers are normally responsible and where their technical expertise and practical knowledge are critical.

The program focuses on research in the synthesis between communication systems engineering and management of engineering processes. Within this context the following areas receive major attention:

- \* Management of Engineering Processes
- \* Network Design, Protocols and Performance
- \* Software Engineering
- \* Wireless and Satellite Communications
- \* Manufacturing Systems Analysis Close links are maintained with the engineering and technological communities, and an effort is made to direct students to thesis and project work of current theoretical and practical significance. The research results should provide useful contributions to the efficient management of engineering processes and the related activities in the telecommunications field.

## Admission Requirements

The normal requirement for admission to the master's program is a bachelor's degree in electrical engineering, computer science or a related discipline, with at least high honours standing. Candidates are required to have two years experience in technical work in telecommunications prior to admission.

Candidates applying for admission with degrees not in the discipline of engineering will be considered by the admissions committee. The committee is responsible for establishing criteria for degree equivalencies.

## Program Requirements

Subject to the approval of the admissions committee, students in the master's program may choose to complete the degree by successfully completing either a thesis or a project.

### *Master's Degree by Thesis*

All master's students in the thesis option are required to complete a total of 5.5 credits as follows:

- \* 1.5 compulsory credits including: 96.501; 96.502; and 96.503
- \* 2.0 approved credits from the list of restricted elective courses below
- \* a thesis equivalent to 2.0 credits

### *Master's Degree by Project*

All master's students in the project option are required to complete a total of 5.5 credits of which at least 5.0 must be at the 500-level or above, as follows:

- \* 1.5 compulsory credits including: 96.501; 96.502; and 96.503
- \* 2.0 approved credits from the list of restricted elective courses below
- \* 1.0 credit of approved non-restricted electives
- \* a graduate project equivalent to 1.0 credit

## Restricted Elective Courses

Students in the master's program must complete 1.0 credit in the field of management of engineering processes and 1.0 credit in communication systems engineering. Courses in each of the four sub-fields and the field of management of engineering processes are listed below.

The sub-fields in communication systems engineering are:

- \* Software Engineering
- \* Wireless and Satellite Communications
- \* Network Design, Protocols and Performance
- \* Manufacturing Systems Analysis

All courses in the field of communication systems engineering are offered by the Department of Systems and Computer Engineering and begin with the prefix 94.

### *Communication Systems Engineering*

- \* Software Engineering  
94.507, 94.511, 94.531, 94.535, 94.553, 94.571, 94.573, 94.574, 94.576, 94.577, 94.579, 94.582
- \* Wireless and Satellite Communications  
94.553, 94.554, 94.566, 94.568
- \* Network Design, Protocols and Performance  
94.501, 94.504, 94.505, 94.507, 94.511, 94.519, 94.521, 94.527, 94.553, 94.567, 94.576, 94.581, 94.588
- \* Manufacturing Systems Analysis  
94.501, 94.504, 94.582, 92.527

*Management of Engineering Processes*

96.504, 96.505, 96.506, 96.508, 96.510, 96.511, 96.512, 96.513, 96.514

**Non-Restricted Elective Courses**

All students in the project option of the master's program are required to complete 1.0 credit from those offered by the Department of Electronics, Department of Mechanical and Aerospace Engineering, Department of Systems and Computer Engineering, School of Industrial Design, or School of Computer Science.

**Graduate Courses**

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions* and *Class Schedule* booklet published in the summer.**

F,W,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Courses in the field of *communication systems engineering* are described below. Courses in the field of *management of engineering processes* are described beginning on p. 334.

Engineering 94.501W1 (ELG6101)

**Simulation and Modelling**

Simulation as a problem solving tool. Random variable generation, general discrete simulation procedure: event table and statistical gathering. Analyses of simulation data: point and interval estimation. Confidence intervals. Overview of modelling, simulation and problem solving using SIMSCRIPT, MODSIM and other languages.

Engineering 94.503F1 (ELG6103I)

**Discrete Stochastic Models**

Models for software, computer systems, and communications networks, with discrete states, instantaneous transitions and stochastic behaviour. Communicating finite state machines and Petri Nets. Review of concepts of probability, and of Markov Chains with discrete and continuous parameters. Basic queueing theory. Numerical methods for Markov Models.

Engineering 94.504F1 (ELG6104)

**Mathematical Programming for Engineering Applications**

Introduction to algorithms and computer methods for optimizing complex engineering systems. Includes linear programming, networks, nonlinear programming, integer and mixed-integer programming, genetic algorithms and search methods, and dynamic programming.

Emphasizes practical algorithms and computer methods for engineering applications

Engineering 94.505W1 (ELG6105)

**Optimization Theory and Methods**

Advanced theory, algorithms and computer methods for optimization. Interior point methods for linear optimization, advanced methods for nonlinear and mixed-integer optimization. Search methods. Applications in engineering. Prerequisite: Engineering 94.504 or the equivalent.

Engineering 94.506W1 (ELG6106)

**Design of Real-Time and Distributed Systems**

Characteristics of real-time and distributed systems. Modern middleware systems, such as CORBA, DCE, RMI for building distributed applications: advantages and disadvantages. Analyzing designs for robustness, modularity, extensibility, portability and performance. Implementation issues. Major course project. Prerequisites: Engineering 94.333 and 94.578 or similar experience.

Engineering 94/95.507F1 (ELG6107)

**Expert Systems**

Survey of some landmark expert systems; types of architecture and knowledge representation; interfering techniques; approximate reasoning; truth maintenance; explanation facilities; knowledge acquisition. A project to implement a small expert system will be assigned. Prerequisite: Computer Science 95.407 or 95.501 or permission of the Department.

Engineering 94.511W1 (ELG6111)

**Design of High Performance Software**

Designing software to demanding performance specifications. Design analysis using models of computation, workload, and performance. Principles to govern design improvement for sequential, concurrent and parallel execution, based on resource architecture and quantitative analysis.

Prerequisite: Engineering 94.574 and a course in software engineering, or the equivalent.

Engineering 94.512W1 (ELG6112)

**Performance Measurement and Modelling of Distributed Applications**

Performance measurements, metrics and models of middleware based systems and applications. Benchmarks, workload characterization, and methods for capacity planning and system sizing. Performance monitoring infrastructures for operating systems and applications. Introduction to the design and analysis of experiments and the interpretation of measurements.

Prerequisite: Engineering 94.511 or the equivalent.

Engineering 94.513

**Software Agents**

Agent-based programming; elements of Distributed Artificial Intelligence; beliefs, desires and intentions; component-based technology; languages for agent implementations; interface agents; information sharing and coordination; KIF; collaboration; communication; ontologies; KQML; autonomy; adaptability; security issues; mobility; standards; agent design issues and frameworks, applications in telecommunications.

Prerequisite: Knowledge of Java, C/C++ or Smalltalk.

Engineering 94.515

**Software Quality Engineering and Management**

All aspects of software quality engineering. Software testing, at all stages of the software development and maintenance life cycle. Software reviews and inspections. Use of software measurement and quantitative modeling for the purpose of software quality control and improvement.

Precludes additional credit for CSI5111 (Computer Science 95.551).

Prerequisites: An undergraduate course in software engineering such as Engineering 94.480 or SEG3300, or equivalent, and basic statistics.

Engineering 94.518W1 (ELG6118)

**Topics in Information Systems**

Recent and advanced topics in the field of Information Systems and its related areas.

Engineering 94.519W1 (ELG6119)

**Teletraffic Engineering**

Congestion phenomena in telephone systems, and related telecommunications networks and systems, with an emphasis on the problems, notation, terminology, and typical switching systems and networks of the operating telephone companies. Analytical queuing models and applications to these systems.

Prerequisite: Engineering 94.553 or ELG5119 or the equivalent.

Engineering 94.520F1 (ELG6120)

**Algebraic Coding Theory**

Review of Algebra, Finite Fields, Linear Block Codes and their Properties, Hamming Codes, Cyclic Codes, Hadamard Matrices and Hadamard Codes, Golay Codes, Reed-Muller Codes, BCH and Reed-Solomon Codes, Decoding Algorithms, Coding Bounds.

Precludes additional credit for Engineering 94.557 (ELG6157).

Engineering 94.521F1 (ELG6121)

**Computer Communication**

Computer network types, introductory queuing theory and performance analysis. OSI layering and BSDN layering modifications. Data link layer. Local area networks and random access (CSMA- CD, switched ethernet, token

ring, wireless LAN). Public Networks. IP networks, addressing, routing. Transport layer, flow control. Introduction to ISDN.

Precludes additional credit for Engineering 92.567 (ELG5374) or 94.462 (ELG4181).

Prerequisite: Undergraduate preparation in probability theory equivalent to Mathematics 69.352.

Engineering 94.527W1 (ELG6127)

**Distributed Systems Engineering**

Techniques for representing distributed systems: precedence graphs, petrinets, communicating state-machines etc. Processes, threads, synchronization and inter-process communication techniques, RPC. Protocol: OSI model, application and presentation layers. Middleware for client-server application management, CORBA. Resource management: processor allocation and load sharing. Real-time issues and scheduling.

Prerequisites: Permission of the Department.

Engineering 94.530

**Health Care Engineering**

Overview of helath care system/participants; biophysical measurements for diagnosis/monitoring; biomedical sensors/technology; telemedicine and applications; safety considerations; managing medical technologies/funding models for clinical engineering departments; considerations for developing countries.

Precludes additional credit for ELG5123 (Engineering 95.526)

Prerequisite: Permission of the instructor.

Engineering 94.535F1 (ELG6135)

**Representations, Methods and Tools for Concurrent Systems**

Selected representations and methods for concurrent systems, such as UML, UML-RT, SDL, supported by current and emerging CASE tools. Comparison, differences, advantages and disadvantages. A colloquium course with most lectures consisting of student presentations based on experience with different CASE tools. Limited enrolment

Prerequisite: Permission of the Department.

Engineering 94.536

**Mobile Computing Systems**

Systems to build mobile applications. Covers data link layer to application layer. Emphasis on existing wireless infrastructure and IETF protocols. Focuses on view of mobile application developer; communication systems, middleware and application frameworks, defacto standards proposed/developed by industry consortia.

Precludes additional credit for Computer Science 95.542 and 95.534 (CSI5169)

Prerequisites: Engineering 92.567 (ELG5374) or 94.521 (ELG6121) or permission of the Department.

Engineering 94.541F1 (ELG6141)

### **Adaptive and Learning Systems**

System identification. Least squares and recursive identification techniques. Asymptotic and theoretical properties. Model structure selection. Prediction and estimation. Model reference adaptive control and self tuning regulators. Nonlinear adaptive systems. Stability. Neural networks and neuro-control. Applications to robotics, control and pattern recognition.

Prerequisite: Engineering 94.552 or equivalent.

Engineering 94.542F1 (ELG6142)

### **Advanced Dynamics With Applications to Robotics**

Lagrange equations and Hamilton's principle. Dynamics of lumped parameter and continuous systems. Natural modes and natural frequencies. Forced vibrations. Stability and bifurcation. Kinematics and dynamics of rigid bodies. Gyroscopic effects. Forward and inverse kinematics of robot manipulators. Denavit-Hartenberg notation. Derivation of manipulator dynamics.

Engineering 94.552F1 (ELG6152)

### **Advanced Linear Systems**

Modelling and state space realization. Review of signals and systems. Solution to the matrix DE. Discrete time systems and the Z transform. Canonical representations and transformations. Controllability, observability and controller and observer design. LQR design and the Kalman filter. Numerous examples and applications.

Engineering 94.553F1, W1 (ELG6153)

### **Stochastic Processes**

Basic concepts of randomness, as applied to communications, signal processing, and queuing systems; probability theory, random variables, stochastic processes; random signals in linear systems; introduction to decision and estimation; Markov chains and elements of queuing theory.

Precludes additional credit for Engineering 92.519 (ELG5119).

Engineering 94.554F1 (ELG6154)

### **Principles of Digital Communication**

Elements of communication theory and information theory applied to digital communications systems. Characterization of noise and channel models. Optimum Receiver theory. Modulation and coding for reliable transmission: MPSK, MQAM, M-ary orthogonal modulation. Channel coding, trellis coded modulation. Spread spectrum and CDMA communications.

Precludes additional credit for Engineering 92.556 (ELG5375).

Prerequisite: Engineering 94.553 or ELG5119 or the equivalent (may be taken concurrently).

Engineering 94.556 (ELG5170)

### **Information Theory**

Measure of information: entropy, relative entropy, mutual information, asymptotic equipartition property, entropy rates for stochastic processes; Data compression: Huffman code, arithmetic coding; Channel capacity: random coding bound, reliability function, Blahut-Arimoto algorithm, Gaussian channels, coloured Gaussian noise and "water-filling"; Rate distortion theory; Network information theory.

Prerequisite: 94.553 (ELG6153) or ELG5119 (92.519) or equivalent.

Precludes credit for 92.551 (ELG5170)

Engineering 94.558F1 (ELG6158)

### **Digital Systems Architecture**

New architectural concepts are introduced. Discussion of programmable architectures (micro-controllers, DSPs, GP) and FPGAs. Memory interfacing. Scalable, superscalar, RISC, CISC, and VLIW concepts. Parallel structures: SIMD, MISD and MIMD. Fault tolerant systems and DSP architectures. Examples of current systems are used for discussions.

Prerequisite: Engineering 94.457 or the equivalent.

Engineering 94.560W1 (ELG6160)

### **Adaptive Signal Processing**

Theory and techniques of adaptive filtering, including Wiener filters, gradient and LMS methods; adaptive transversal and lattice filters; recursive and fast recursive least squares; convergence and tracking performance; implementation. Applications, such as adaptive prediction, channel equalization, echo cancellation, source coding, antenna beamforming, spectral estimation.

Precludes additional credit for Engineering 92.580 (ELG5377).

Prerequisites: Engineering 94.553 or ELG5119 or equivalent; Engineering 94.562 or ELG5376 or equivalent.

Engineering 94.561W1 (ELG6161)

### **Neural Signal Processing**

Multidimensional function approximation. The least squares adaptive algorithm and the generalized dela rule. Multi-layered perceptrons and the back-propagation algorithm. Approximation of non-linear functions. Radial basis functions. Self-organizing maps. Applications of neural signal processing to control, communications and pattern recognition.

Precludes additional credit for Engineering 92.579 (ELG5796).

Prerequisite: Engineering 94.553 or ELG6153 or equivalent. May be taken concurrently with 94.553.

Engineering 94.562F1 (ELG6162)

### **Digital Signal Processing**

Review of discrete time signals and systems, A/D and D/A conversions, representation in

time, frequency, and Z domain, DFT/FFT transforms, FIR/IIR filter design, quantization effects. Correlation functions. Cepstrum analysis. Multi-rate signal processing. Power spectrum estimation. Introduction to joint time-frequency analysis. DSP architecture: implementation approaches. Applications. Precludes additional credit for Engineering 92.557 (ELG5376).

Engineering 94.563W1 (ELG6163)

**Digital Signal Processing: Microprocessors, Software and Applications**

Characteristics of DSP algorithms and architectural features of current DSP chips: TMS320, DSP-56xxx, AD-21xxx and SHARC. DSP multiprocessors and fault tolerant systems. Algorithm/software/hardware architecture interaction, program activity analysis, development cycle, and design tools. Case studies: LPC, codecs, FFT, echo cancellation, Viterbi decoding.

Prerequisite: Engineering 94.562 or ELG5376 or the equivalent.

Engineering 94.564W1 (ELG6164)

**Advanced Topics in Digital Signal Processing**

Recent and advanced topics in the field of digital signal processing and its related areas. Prerequisites: Engineering 94.562 or ELG5376 or the equivalent.

Engineering 94.565W1 (ELG6165)

**Advanced Digital Communication**

Techniques and performance of digital signaling and equalization over linear bandlimited channels with additive Gaussian noise. Fading multipath channels: diversity concepts, modelling and error probability performance evaluation. Synchronization in digital communications. Spread spectrum in digital transmission over multipath fading channels.

Precludes additional credit for Engineering 92.574 (ELG5780).

Prerequisite: Engineering 94.554 or the equivalent.

Engineering 94.566W1 (ELG6166)

**Introduction to Mobile Communications**

Mobile radio channel characterization: signal strength prediction techniques and statistical coverage; fading; delay spread; interference models and outage probabilities. Digital modulation and transmission system performance. Signal processing techniques: diversity and beamforming, adaptive equalization, coding. Applications to TDMA and CDMA cellular systems.

Co-requisite: Can be taken concurrently with Engineering 94.553 and 94.554.

Engineering 94.567F1 (ELG6167)

**Source Coding and Data Compression**

Discrete and continuous sources. Discrete sources: Huffman coding & run length encod-

ing. Continuous sources: waveform construction coding; PCM, DPMC, delta modulation; speech compression by parameter extraction; predictive encoding; image coding by transformation and block quantization. Fourier and Walsh transform coding. Applications to speech, television, facsimile.

Prerequisite: Engineering 94.553 or ELG5119 or the equivalent.

Engineering 94.568W1 (ELG6168)

**Wireless Communications Systems Engineering**

Multisuser cellular and personal radio communication systems; frequency reuse, traffic engineering, system capacity, mobility and channel resource allocation. Multiple access principles, cellular radio systems, signalling and interworking. Security and authentication. Wireless ATM, satellite systems, mobile location, wireless LANs, wireless local loops, broadband wireless, etc.

Corequisites: Engineering 94.553 or ELG5119, and 94.554 or ELG5375, or their equivalents.

Engineering 94.569W1 (ELG6169)

**Digital Television**

Television standards: NTSC, PAL, SECAM, and HDTV. Sampling and quantization of television signals: rec 601-1. Digital video compression: inter and intra-frame methods, spatial and transform/wavelet coding; H.261 and MPEG standards. Video conferencing systems and other digital video processing applications.

Engineering 94.570W1 (ELG6170)

**Spread Spectrum Systems**

Types of spread spectrum systems, FH and DS-SS, Hybrid DS/FH-SS. Pseudo-noise generators: statistical properties of M sequences, Galois field connections, Gold codes. Code tracking loops, initial synchronization of receiver spreading code. Performance in jamming environments and fading channels. Code division multiple access systems.

Prerequisite: Engineering 94.554 or (ELG 6154) or the equivalent.

Engineering 94.571F1 (CSI5117)

**Operating System Methods for Real-Time Applications**

Principles and methods for operating system design with application to real-time, embedded systems. Concurrent programming: mechanisms and languages; design approaches and issues; run-time support (kernel). Methods for hard real-time applications. Methods for distributed systems. Programming assignments in a suitable programming language.

Prerequisites: Engineering 94.333 or 94.574 or equivalent courses and/or experience. Programming experience in high level and assembly languages.

Engineering 94.573F1 (ELG6173)

### **Integrated Database Systems**

Database definitions, applications, architectures. Conceptual design based on entity-relationship, object-oriented models. Relational data model: relational algebra and calculus, normal forms, data definition and manipulation languages. Database management systems: transaction management, recovery and concurrency control. Current trends: object-oriented, knowledge-based, multimedia, distributed databases.  
Prerequisite: Engineering 94.574 or the equivalent.

Engineering 94.574F1 (ELG6174)

### **Elements of Computer Systems**

Concepts in basic computer architecture, assembly languages, high level languages including object orientation, compilers and operating system concepts (including concurrency mechanisms such as processes and threads and computer communication). Designed for graduate students without extensive undergraduate preparation in computer system engineering (or the equivalent experience).  
Prerequisites: Programming experience with at least one high level language and permission of the Department.

Engineering 94.576F1 (ELG6176)

### **Analytical Performance Models of Computer Systems**

Analytical modelling techniques for performance analysis of computing systems. Theoretical techniques covered include single and multiple class queuing network models, together with a treatment of computational techniques, approximations, and limitations. Applications include scheduling, memory management, peripheral devices, databases, multiprocessing, and distributed computing.  
Prerequisite: Engineering 94.503, 94.553 or ELG5119, or the equivalent.

Engineering 94.578 (ELG6178)

### **Development of Real-Time and Distributed Software with Reusable Components**

Advanced object-oriented design and programming of real-time and distributed systems using C++ and/or Java. Object-oriented features: inheritance, polymorphism, templates, exception handling. Concurrency issues. Design patterns and frameworks for distributed systems, with examples from communication applications. Design issues for reusable software.  
Prerequisites: Knowledge of C++ and/or Java, of operating system concepts, and permission of the Department.

Engineering 94.579F1, W1 (ELG6179)

### **Advanced Topics in Software Engineering**

Recent and advanced topics in the field of

software engineering and related areas. Primary references are recent publications in the field.

Prerequisite: Permission of the Department.

Engineering 94.580F1 or W1, (ELG 6180)

### **Network Computing**

Design and Java implementation of distributed applications that use telecommunication networks as their computing platform. Basics of networking; Java networking facilities. Introduction to open distributed processing; CORBA, JavaDL, JavaRMI, CGI/HTTP, DCOM, Componentware; Enterprise JavaBeans, ActiveX. Agents: Java code mobility facilities. Security issues; Java security model.

Engineering 94.581F1 (ELG6181)

### **Advanced Topics in Computer Communications**

Recent and advanced topics in computer-communication networks intended as a preparation for research. Students are expected to contribute to seminars or present lectures on selected topics.

Prerequisites: Engineering 94.521 or ELG5374 or equivalent and permission of the Department.

Engineering 94.582F1 (ELG6182)

### **Introduction to Information and System Science**

An introduction to the process of applying computers in problem solving. Emphasis is placed on the design and analysis of efficient computer algorithms for large, complex problems. Applications in a number of areas are presented: data manipulation, databases, computer networks, queuing systems, optimization. (Also listed as Mathematics 70.582, Computer Science 95.582 and Information and Systems Science 93.582)

Engineering 94.583W1 (ELG6183)

### **Logic Programming**

Review of relational databases, first order predicate calculus, semantics of first order models, deductive querying. Proof theory, unification and resolution strategies. Introduction to Prolog, and/or parallelism and Concurrent Prolog. Applications in knowledge representation and rule based expert systems.

Engineering 94.584F1, W1 (ELG6184)

### **Advanced Topics in Communications Systems**

Recent and advanced topics in communications systems.

Prerequisite: Permission of the Department.

Engineering 94.586F1 (ELG6186)

### **Object Oriented Design of Real-Time and Distributed Systems**

Advanced course in software design dealing

with design issues at a high level of abstraction. Design models: use case maps for high-level behaviour description; UML for traditional object-oriented concerns. Design patterns. Forward, reverse, and re-engineering. Substantial course project on applications chosen by students.

Precludes additional credit for Computer Science 95.543.

Prerequisite: Permission of the Department.

Engineering 94.587F1, W1, S1 (ELG6187)

**Advanced Topics in Computer Systems**

Recent and advanced topics in computer systems. The course will generally focus on one or more of the following areas: specification, design, implementation, and modeling/analysis. Students may be expected to contribute to lectures or seminars on selected topics.

Prerequisite: Permission of the Department.

Engineering 94.588W1 (ELG6188)

**Communications Network Management**

Network management issues. WANs and LANs. The internet and ISO models of network management. Network management protocols SNMP, CMIP, CMOT, etc. Events, Managed Objects and MIBs. Fault management techniques. Current diagnostic theory and its limitations. AI and Machine learning approaches. Monitoring and fault management tools.

Prerequisite: Engineering 94.521 or equivalent.

Engineering 94.590F1, W1, S1

**Systems Engineering Project**

Students pursuing the non-thesis M.Eng. program conduct an engineering study, analysis, and/or design project under the supervision of a faculty member.

Engineering 94.591F2, W2, S2

**Systems Engineering Project**

Project similar to Engineering 94.590, but either of greater scope or longer duration.

Engineering 94.593F2, W2, S2

**Cooperative Program Project**

A one-term course, carrying a full-course credit, for students pursuing the cooperative M.Eng. program. An engineering study, analysis, and/or design project under the supervision of a faculty member. This course may be repeated for credit.

Engineering 70/94/95.595F4, W4, S4

**M.C.S. Thesis**

Engineering 94.596F1, W1, S1 (ELG6196)

**Directed Studies**

Engineering 70/93/94/95.598F3, W3, S3

**M.Sc. Thesis in Information and Systems Science**

Engineering 94.599F4, W4, S4

**M.Eng. Thesis**

Engineering 94.699F, W, S

**Ph.D. Thesis**

*The following are courses in the field of management of engineering processes, and begin with the prefix 96.*

Engineering 96.501F1

**Management Principles for Engineers**

Develops a common level of knowledge among students on topics in project management, leadership, industrial marketing, managerial economics and organizational behaviour. These topics are relevant for engineers and computer scientists who manage the engineering processes that deliver innovative telecommunications systems, products and services.

Engineering 96.502F1

**Telecommunications Technology**

Fundamentals of telecommunications technology with emphasis on importance of bandwidth, communications reliability and networks. Topics include: information sources and coding of outputs; channel characteristics; signals; networks, signalling and switching; standards and regulation; major world systems and operators; and the thrust of new and future technology.

Engineering 96.503W1

**Issues in Telecommunications**

Discussion of key readings relevant to the telecommunications industry. Topics include the introduction of new products to the global market, technology sourcing, intellectual property rights, industry trends, technology and ethics, user interface design, new business opportunities and product identification, industry characteristics, regulation and international competition

Engineering 96.504W1

**Management of Design Systems**

The focus is on how to design, maintain, expand and evolve organizations that deliver hardware, software and systems designs, and on the methods and tools used to improve their performance. Topics include: essence of design; how to set-up and lead fast-to-market organizations.

Prerequisite: Engineering 96.501 and 96.502.

Engineering 96.505S1

**Management of Telecommunications System Design**

The focus is on the groups that evolve the architecture and technological infrastructures of firms and on product management. Topics include: relationship between architecture and product management; appropriability regimes; technology and complementary assets; managing projects that deliver products at different stages of their life cycles.

Prerequisite: Engineering 96.501 and 96.502.

Engineering 96.506W1

**Management of Software Engineering Projects**

Models for the development of software. Software project management tools. Quality control. Risk assessment and management. Examples are drawn from software development in telecommunications applications.

Prerequisite: Engineering 96.501 and 96.502.

Engineering 96.508S1

**Corporate Communications Networks**

Communications networks as a vital resource within organizations. Private networks as an infrastructure for information flow within a firm and across its interfaces. Applications and operations of corporate telecommunications networks. Networks as a source of competitive advantage. Implementation issues.

Prerequisite: Engineering 96.501 and 96.502.

Engineering 96.510S1

**Communications Standards**

Importance of global standards in telecommunications and information technology for product development and business. Relevant public standards classified by type. The standards setting process. Formulation and execution of standards setting strategies. Integrating the firm's standards program with engineering processes, product management, systems groups and marketing.

Prerequisite: Engineering 96.501 and 96.502.

Engineering 96.511W1

**Integrated Product Development**

The new product introduction process and time-based competition, basic concepts of integrated product development (concurrent engineering), the voice of the customer, quality function deployment, cross-functional teams, integrating information systems and technical tools, organizational support, manufacturing and design, cost estimation, implementation problems.

Prerequisite: Engineering 96.501 and 96.502.

Engineering 96.512F1

**Managing Full-Scale Production**

Overall philosophy of just-in-time and time-based competition; just-in-time production and manufacturing resource planning; total quality management; socio-technical systems and employee participation; advanced manufacturing; manufacturing and facilities strategy; capacity planning; manufacturing flexibility; product/process evolution and the experience curve; service aspects of manufacturing.

Prerequisite: Engineering 96.501 and 96.502.

Engineering 96.513F1,W1,S1

**Advanced Topics in Telecommunications Technology Management**

In-depth exploration of an advanced topic in the field of telecommunications technology management. A different topic is covered each semester and more than one section, with different topics, may be offered in the same semester.

Prerequisite: One of Engineering 96.504, 96.505, 96.511, or 96.512.

Engineering 96.514F1,W1,S1

**Directed Studies in Design and Manufacturing Management**

The student explores, through extensive literature surveys, specific topics in the areas of design and manufacturing management. The objective is to acquire a suitable background to initiate and complete thesis work requiring this preparation. Precludes credit for any other directed studies in the program.

Engineering 96.591F2,W2,S2

**M.Eng. Project**

Engineering 96.599F4,W4,S4

**M.Eng. Thesis**

Engineering 96.514F1,W1,S1

**Directed Studies in Design and Manufacturing Management**

The student explores, through extensive literature surveys, specific topics in the areas of design and manufacturing management. The objective is to enable study on a specific topic to acquire a suitable background to initiate and complete thesis work. Precludes credit for any other directed studies.

Engineering 96.591F2,W2,S2

**M.Eng. Project**

Engineering 96.599F4,W4,S4

**M.Eng. Thesis**

## Women's Studies

Dunton Tower 1419  
Telephone: 520-6645  
Fax: 520-2564

### The Institute

**Director,** L. Pauline Rankin

The Pauline Jewett Institute of Women's Studies does not offer a program at the graduate level. However, it does offer graduate-level courses which can, with the permission of the school, institute, or department in which the student is enrolled, be used towards a degree program.

### Graduate Courses

**Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings for 2001-2002, please consult the *Registration Instructions and Class Schedule* booklet published in the summer.**

FW,S indicates term of offering. Courses offered in the fall and winter are followed by T. The number following the letter indicates the credit weight of the course: 1 denotes 0.5 credit, 2 denotes 1.0 credit, etc.

Women's Studies 09.500F1 or W1

#### **Issues for Feminist Scholarship**

An interdisciplinary examination of the development of feminist scholarship. Critical analysis of such questions as the connection between feminist scholarship and activism; the interconnections between gender and social class, race/ethnicity, and sexual orientation; the challenge of integrating feminist research into the traditional disciplines.

Prerequisite: Graduate standing and permission of the Institute.

Women's Studies 09.501F1 or W1

#### **Research Seminar in Women's Studies**

A seminar in which each student undertakes a cross-disciplinary research project for which gender is a primary category of analysis.

Prerequisite: Women's Studies 09.500 and permission of the Institute.

## **General Information**

- Calendar of Milestones
- Faculty - Graduate Supervisors
- Officers of the University
- Public Lectures

# Calendar of Milestones

## The Institution

**1942**

The Ottawa Association for the Advancement of Learning was established to develop Carleton College. The College offered only evening classes in introductory university subjects, with some courses in public administration.

**1943**

The Ottawa Association for the Advancement of Learning was incorporated and the Institute for Public Administration was established.

**1945**

Beginning of day classes and full-time teaching in arts, science, journalism, and first-year engineering. Establishment of the Faculty of Arts and Science.

**1946**

Move from rented premises to First Avenue campus, formerly Ottawa Ladies' College. First degrees awarded in journalism and public administration.

**1947**

The College committed itself to develop pass and four-year honours programs.

**1949**

First undergraduate pass degrees in arts, science, and commerce awarded. Formation of Senate.

**1950**

First honours degrees in arts and science awarded.

**1952**

The Carleton College Act, 1952 passed by the Ontario Legislature. This changed the corporate name to Carleton College and confirmed the power to grant degrees. Property for Rideau River campus acquired.

**1953**

Establishment of the School of Public Administration.

**1954**

Appointment of Architectural Associates for Carleton to prepare a master plan for Rideau River campus, and to design the first group of buildings. First honorary degree (LL.D.) conferred on Dag Hammarskjöld, Secretary-General of the United Nations.

**1955**

First Master of Arts degree awarded.

**1957**

The Carleton University Act, 1957. Establishment of the School of Engineering. Establishment of the Institute of Canadian Studies.

**1958**

First Master of Science degree awarded.

**1959**

Move to Rideau River campus, following construction of the Henry Marshall Tory Building (science), the Maxwell MacOdrum Library, and Norman Paterson Hall (arts).

**1961**

First Ph.D. degree in science awarded. First degrees in engineering awarded.

**1962**

Southam Hall, the University Commons, Renfrew House and Lanark House (residences) completed. Norman Paterson Hall extended, and University Union opened.

**1963**

First Master of Engineering degree awarded. Reorganization into the Faculties of Arts, Engineering, Science, and Graduate Studies and Research.

**1964**

The C.J. Mackenzie Building (engineering) completed.

**1965**

The E.W.R. Steacie Building (chemistry), Grenville House and Russell House (residences), Maintenance Building, and Heating Plant completed.

**1966**

First Ph.D. degree in engineering awarded. The Physics Building completed (designated in 1972 as the Herzberg Laboratories for Physics). Establishment of the Schools of International Affairs and Commerce.

**1967**

Loeb Building (social sciences) completed. Integration of St. Patrick's College as a division of the Faculty of Arts. Integration of the School of Social Work.

**1968**

First Ph.D. degree in arts awarded. First Master of Social Work degree awarded. Establishment of the School of Architecture.

**1969**

Controlled Environmental Facility (biology), Administration Building, Glengarry House (residence), and University Commons (residence cafeteria) completed.

**1970**

University Centre and Parking Garage completed.

**1971**

Arts Tower completed.

**1972**

Architecture Building completed. School of Social Work accommodated on the Rideau River campus.

**1973**

St. Patrick's College moves to new facility on the Rideau River campus. First degrees in architecture awarded. New athletic complex containing 50-metre pool and fitness centre opened. School of Industrial Design established.

**1974**

Faculty of Graduate Studies and Research expanded into the Faculty of Graduate Studies and Research. School of International Affairs renamed the Norman Paterson School of International Affairs. Master of Journalism program approved for September 1974. Master of Arts programs in anthropology and in religion approved for September 1975. Program leading to Certificate in the Teaching of English as a Second Language established.

**1975**

Lester B. Pearson Chair for International Affairs approved for January 1, 1975. Establishment of Gerhard Herzberg Lecture Series in Science.

**1976**

First Dunton Alumni Award presented, January 1976. Creation of the Paterson Centre for International Programs in March 1976. Division of the Faculty of Arts into two separate faculties: the Faculty of Arts and the Faculty of Social Sciences, effective July 1976. First Master of Journalism degrees awarded, November 1976.

**1977**

Opening of the Criminology and Corrections concentration at St. Patrick's College, April 1977.

**1978**

School of Continuing Education established. Credit courses offered on cable television for the first time. Institute of Biochemistry established.

**1979**

St. Patrick's College ceased to operate as an academic unit of the University. Academic programs of the college continue as University programs, except for the Unified Liberal Arts Program.

**1980**

Establishment of the School of Computer Science. Establishment of the Chair of Office Automation in the Faculty of Engineering.

**1981**

Establishment of the Ottawa-Carleton Institute for Graduate Studies and Research in Chemistry, a joint program with the University of Ottawa. Establishment of a joint Ph.D. program in economics with the University of Ottawa.

**1982**

Establishment of the Ottawa-Carleton Centre for Geoscience Studies, representing the combined research strengths of Carleton University and the University of Ottawa, with programs leading to M.Sc. and Ph.D. degrees in most areas of geology. Establishment of a joint master's program in computer science with the University of Ottawa.

**1983**

Establishment of four joint graduate programs with the University of Ottawa: the Ottawa-Carleton Centre for Graduate Studies and Research in Biology; the Ottawa-Carleton Centre for Graduate Studies and Research in Physics; the Ottawa-Carleton Institute for Graduate Studies and Research in Electrical Engineering; and the Ottawa-Carleton Graduate Specialization in Neuroscience.

**1984**

Establishment of three joint graduate programs with the University of Ottawa in the areas of civil engineering, mechanical and aeronautical engineering, and mathematics and statistics.

**1985**

Master of Management Studies program established in the School of Business. The School of Public Administration offers a concentration in development administration in conjunction with the Norman Paterson School of International Affairs. An additional floor on one wing of the Herzberg Laboratories for Physics is constructed to house the School of Computer Science.

**1986**

The Social Sciences Research Building, the first new building on campus in a decade, is built to accommodate the rapidly-expanding research activity in the Faculty of Social Sciences. Construction of an annex on top of the Architecture Building to provide additional space for the Faculty of Engineering.

**1987**

The Institute of Women's Studies is established. The Arts Tower is renamed Davidson Dunton Tower/Edifice Davidson Dunton in honour of Arnold Davidson Dunton, former Carleton University President and Director of the Institute of Canadian Studies. Major revisions to the Undergraduate Exchange Agreement with the University of Ottawa extend opportunities for students to study at both universities. The

University launches the Carleton University Challenge Fund, the largest fund-raising campaign in its history.

# 1989

The University launches its first major program of construction and renovation in more than 20 years. Four capital projects are initiated: an addition to the MacOdrum Library; the Minto Centre for Advanced Studies in Engineering; a 400-bed residence building; and an addition to Southam Hall. A fifth project, the Life Sciences Research Building, is completed in 1989. The Institute of Political Economy is established. The Canadian Centre for Trade Policy and Law, a joint initiative of the Norman Paterson School of International Affairs at Carleton and the Faculty of Law at the University of Ottawa, is established.

# 1990

A new Ph.D. program in computer science, offered jointly with the University of Ottawa, is established. The University introduces a Bachelor of Social Work degree program. The Paul Menton Centre for Persons with Disabilities is opened. The Centre for Research in Particle Physics is established to carry on the work of the National Research Council's large-scale physics projects.

# 1991

Establishment of the Carleton University Development Corporation. \$11 million extension to the MacOdrum Library opened. The university's \$30 million Challenge Fund campaign surpassed its goal; \$1.5 million "enhancement" campaign announced. Registrarial services for arts and social sciences re-organized into two separate offices. Establishment of the Centre for Analytical and Environmental Chemistry. Establishment of the School of Comparative Literary Studies. Establishment of the School for Studies in Art and Culture (bringing together the Departments of Art History, Film Studies, and Music). Establishment of the international exchange agreement between Carleton University, four Swedish universities, and three other Canadian universities (Laval, York, and the University of British Columbia). Establishment of the Carleton University/Polish faculty exchange agreement. Establishment of the Chair for Management in Technological Change. Establishment of M.A. programs in political economy, communication, legal studies, and applied language studies. Establishment of the women's history field in the Ph.D. program in history. Establishment of the Ph.D. program in public policy in the School of Public Administration.

# 1992

The University celebrates its 50th anniversary. Institute for Interdisciplinary Studies, which includes a new B.A. program in environmental studies, is established. Department of Civil Engineering renamed Department of Civil and Environmental Engineering to reflect emphasis on the environment and new undergraduate program in environmental engineering. School of Journalism renamed School of Journalism and Communication, and Institute of Canadian Studies becomes School of Canadian Studies. The Centre for Aboriginal Education, Research and Culture is established. A new Ph.D. program in public policy, the first of its kind in Canada, is offered by the School of Public Administration, and a master's program in Canadian art history is introduced. The Carleton University Art Gallery and the Minto Centre for Advanced Studies in Engineering are opened. The Governor General of Canada and Head of the Canadian Heraldic Authority, His Excellency the Right Honourable Ramon John Hnatyshyn, grants the arms and flag of Carleton University at the fall convocation ceremonies.

# 1993

Centre for Memory Assessment and Research established. Teaching and Learning Resource Centre established. Institute of Soviet and East European Studies renamed Institute for Central/East European and Russian Area Studies. Carleton University hosts the 1993 Learned Societies Conference. Construction begins on new Inco Centre. Institute of Women's Studies renamed Pauline Jewett Institute of Women's Studies. Administration Building renamed Robertson Hall.

# 1994

New Industrial Research Chair in Performance Engineering of Real-Time Software established. The Inco Centre officially opened. Research Facility for Electron Microscopy opened. New Ph.D. program in Public Policy established. New Bachelor of International Business program approved. Colonel By Child Care opened. Construction begins on the new Carleton Technology and Training Centre.

# 1995

Carleton Technology and Training Centre opened. Bachelor of Humanities undergraduate degree program established. College of the Humanities approved.

# 1997

Two new faculties created: the Faculty of Arts and Social Sciences and the Faculty of Public Affairs and Management. Department of Religion joined the College of the Humanities. School of Architecture modified its program to create a four-year degree program, with the

professional designation provided by the two-year master's program. Bachelor of Arts program improved with standardization of programs across all departments and introduction of programs to allow students to improve their academic skills and to "tailor" their degrees to specific goals. Physics undergraduate degree program replaced with an applied physics program. Several small language programs closed: German, Italian, Russian, Spanish) as well as undergraduate programs in Comparative Literary Studies and Classics. New undergraduate program in Communications Engineering established. Co-operative education programs offered in all engineering programs.

The following graduate programs were established: Ph.D. in Cognitive Science; Ph.D. in Communications; Master of Arts in Film Studies; Master of Arts in Public Administration (with a Concentration in Innovation, Science, and Technology Policy); and the Graduate Certificates in Conflict Resolution and in Health and Social Policy in Development.

#### 1998

Faculty of Science realigned its departments into the College of Natural Sciences and the School of Mathematics and Statistics. Centre for Initiatives in Education added to the Faculty of Arts and Social Sciences. Department of Geography renamed the Department of Geography and Environmental Studies.

Two new degree programs created: Bachelor of Mathematics and Bachelor of Public Affairs and Policy Management. Two new programs added to the Bachelor of Arts degree program: Art and Culture, and Criminology and Criminal Justice.

New programs established in Computational Chemistry, Engineering Physics and Software Engineering. Master of Science in Information and Systems Science (MSciSS) program expanded.

School of Computer Science established a computer retraining certificate program. Office to coordinate co-op placements for engineering and science students opened.

#### 1999

A \$6.4 million expansion to the Minto Centre for Advanced Studies in Engineering is approved. The addition of three floors will provide additional teaching and research space to accommodate the significant growth in informational technology programs.

Two new computational science programs are introduced—Computational Biology and Computational Biochemistry. Senate approves new MEng and PhD programs in Environmental En-

gineering, as well as the establishment of minors in German, Spanish, Italian, and Russian. Other new programs include a B.A. (Honours) in Geographic Information Processing, a Combined Honours in Human Rights, a B.A. and B.A. (Honours) in History and Theory of Architecture, and a new Ph.D. in Cultural Mediation. New guidelines are approved for applicants from community colleges.

The Institute of Comparative Studies in Literature, Art and Culture is established within the Faculty of Arts and Social Sciences.

The Nortel Networks-Carleton University Laboratory for Advanced Materials Research at Carleton University opens, allowing researchers to create the next wave of information technology products.

Arthur Kroeger College of Public Affairs is opened in October. The new College, named in honour of Carleton University's Chancellor and one of Canada's leading experts in public affairs, Arthur Kroeger, is the home of the new Bachelor of Public Affairs and Policy Management (B.P.A.P.M.) program.

The Texas Instruments and Nortel Networks DSP Lab for Advanced Communications Research and Education opens in September, making Carleton the first university in Canada to become a Texas Instruments (TI) digital signal processing (DSP) "elite" laboratory.

The Carleton University School of Social Work celebrates its 50<sup>th</sup> anniversary.

The wind tunnel in the MacKenzie Building is renamed to illustrate the long-established relationship between Carleton and Pratt and Whitney Canada (PWC). The lab gives graduate students, researchers and PWC engineers the opportunity to collaborate on leading-edge turbine aerodynamics research.

The Institute of Central/East European and Russian-Area Studies is renamed the Institute of European and Russian Studies. The B.A. (Honours) in CERAS is changed to European and Russian Studies.

#### 2000

The Faculty of Science introduces a new Seminar in Science to support first-year students entering Science at Carleton. The Enriched Support Program is expanded to include the sciences. A new five-credit Sonic Design Diploma is launched to provide focused training in musical applications in the computing field. Carleton's introduces a new B.A. program in Classics, Religion, and Humanities. Computational Geophysics is added to the Computational Sciences programs. A new joint Ph.D. program in Canadian Studies with Trent Uni-

versity is approved. The B.A. in Religion and the Certificate in Law Enforcement Studies are closed. A Minor in Technology, Society, and Environmental Studies is introduced.

New University-wide regulations for academic standing, promotion, and graduation are approved.

Construction begins on several new campus initiatives, including a new Residence, a Biology building, and a Light Rail Project.

The three-storey addition to the Minto CASE Building is completed.

Carleton is awarded \$40 million by the provincial government for extra classroom and lab space, improved Science facilities, and enhanced research and private sector partnerships.

The first class of Carleton Humanities students graduates at Spring Convocation.

The School of Public Administration is renamed The School of Public Policy and Administration.

For the first time in Carleton's history, the average first-year high school entrance grade is more than 80 percent.

## Chancellors

### 1952 - 1954

Harry Stevenson Southam

### 1954 - 1968

Chalmers Jack Mackenzie

### 1969 - 1972

Lester Bowles Pearson

### 1973 - 1979

Gerhard Herzberg

### 1980 - 1990

Gordon Robertson (Emeritus 1992 - )

### 1990 - 1992

Pauline Jewett

### 1993 -

Arthur Kroeger

## Presidents

### 1942 - 1947

Henry Marshall Tory

### 1947 - 1955

Murdoch Maxwell MacOdum

### 1955 - 1956

James Alexander Gibson (acting)

### 1956 - 1958

Clayde Thomas Bissell

### 1958 - 1972

Arnold Davidson Dunton

### 1972 - 1978

Michael Kelway Oliver

### January 1 - May 15, 1979

James Downey (pro tempore)

### 1979 - 1989

William Edwin Beckel

### 1989 - 1996

Robin Hugh Farquhar

### 1996 -

Richard J. Van Loon

## Faculty

The following members of the faculty of Carleton University, together with Adjunct Research Professors, have been approved as supervisors of graduate theses and research essays, under criteria established by the Senate of the University. Since some appointments will be made subsequent to the publication deadline for this calendar, students are advised to consult their department for a complete list.

### Architecture

**K.S. Andonian**, M.Arch. (Yerevan Polytechnic), M.A.Sc., Ph.D. (Waterloo), M.R.A.I.C.

**Manuel Antonio Báez**, B.Arch. (Cooper Union, Irwin S. Chanin School of Arch.), M.Arch. (Cranbrook)

**Y. Cazabon**, dipl.A.T., B.Arch. (Carleton), M.Arch. (McGill), M.R.A.I.C.

**Janine Debanné**, B.Arch. (Carleton), M.Arch. (McGill)

**Tom Dubicanac**, B.Arch., M.Arch. (Detroit)

**S. Fai**, B.Arch. (Carleton), B.A., M.A. (Ottawa), M.R.A.I.C.

**L. Fontein**, B.Arch. (Toronto), M.Arch. (McGill), O.A.Q.

**Benjamin Gianni**, B.A. (Pennsylvania), M.Arch. (Yale)

**C.C. Gordon**, B.A. (Amherst), Ph.D. (North Carolina)

**S.G. Haider**, B.Sc. (West Pakistan), M.S., B.Arch., Ph.D. (Illinois)

**M. Jemtrud**, B.Arch. (Pennsylvania State), M.Arch. (McGill)

Adjunct Research Professors

**J.W. Archer**, B.A. (McGill), B.Arch., M.A. (Carleton)

**John Cook**, D.Arch. (Cambridge), M.A. (Cambridge)

**Paul duBellet Kariouk**, B.S.Arch. (Virginia), M.Arch. (Columbia)

**B.M. Firestone**, B.Eng. (McGill), M.Eng. (Univ. of New South Wales), Ph.D. (Australian Nat. Univ.)

### Studies in Art and Culture

**Geraldine Finn**, B.A. (Keele), M.A. (McMaster), Ph.D. (Ottawa)

### Art History

**Michael Bell**, B.A., M.A. (Toronto)

**A.K. Carr**, LL.B. (York), B.A., M.A., Phil.M., Ph.D. (Toronto)

**K.J. Crossman**, B.A. (Winnipeg), M.A. (Toronto), Ph.D. (Edinburgh)

**Randi Klebanoff**, B.A. (Concordia), M.A. (British Columbia), Ph.D. (Harvard)

**Natalie Luckyj**, B.A., M.A. (Toronto)

**Roger Mesley**, B.A., M.A., Ph.D. (Toronto)

**C. Payne**, B.F.A. (York), M.A., Ph.D. (Boston)

Adjunct Research Professors

**T.J.C. Brasser**, Cands. C.A., Drs. (Leiden)

**Christina Cameron**, B.A. (Toronto), M.A. (Brown), Ph.D. (Laval)

**Stephen Inglis**, B.A. (British Columbia), M.A. (Calcutta), Ph.D. (British Columbia)

**Lilly Koltun**, B.A. (Toronto), M.A. (London)

**M.E. Jackson**, A.B., M.A., Ph.D. (Michigan)

**Andrea Laforet**, B.A., Ph.D. (British Columbia)

**George MacDonald**, B.A. (Toronto), Ph.D. (Yale)

**G. McMaster**, B.F.A. (Minneapolis), M.A. (Carleton)

**D. Nemiroff**, B.F.A., M.A. (Concordia)

### Film Studies

**C.G. Faulkner**, B.A. (Sir George Williams), M.A. (Western)

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**Charles O'Brien**, B.A. (Nebraska), Ph.D. (Iowa)

**Z.M. Pick**, Licencès-Lettres, Maitrise, D.de 3<sup>e</sup> cycle, (Paris)

Adjunct Research Professors

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**Peter Baxter**, B.A. (Windsor), M.A. (Simon Fraser), Ph.D. (London)

**Peter Harcourt**, B.A., M.A. (Downing College), (Cambridge)

**Deborah Knight**, B.A., M.A. (Carleton), M.A. (Ottawa), Ph.D. (Toronto)

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## Music

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**B.R. Gillingham**, A.R.C.T., B.A., B.Mus. (British Columbia), M.Mus. (Kings College), Ph.D. (Washington)

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Adjunct Research Professors

**V.B. Archer**, B.Mus. (McGill), B.Mus. (York), B.Mus., M.Mus. (Yale), D. Mus. (Windsor), Hon. LLD (Calgary), Hon. LLD (Alberta)

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**Helmut Kallmann**, B.Mus. (Toronto)

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## Biology

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**M.E. McCully**, B.Sc., M.Sc. (Toronto), Ph.D. (Harvard)

Honorary Research Professors

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## Business

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## Canadian Studies

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Fellows

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## Chemistry

**A.D.O. Bawagan**, B.Sc. (Philippines), M.Sc. Houston, Ph.D. (British Columbia)

**G.W. Buchanan**, B.Sc., Ph.D. (Western Ontario)

**P.H. Buist**, B.Sc., Ph.D. (McMaster)

**R.C. Burk**, B.Sc., M.Sc., Ph.D. (Carleton)

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**B.R. Hollebhone**, B.Sc. (Carleton), Ph.D. (London)

**Peeter Kruus**, B.Sc. (Toronto), Lic. Tech. (Denmark), Ph.D. (Toronto)

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*Distinguished Research Professor*

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*Adjunct Research Professors*

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**N. De Silva**, Ph.D. (Dalhousie)

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**M.F. Fingas**, B.A. (Concordia Senior College), B.Sc. (Alberta) M.A., M.Sc. (Ottawa), Ph.D. (McGill)

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**K.U. Ingold**, B.Sc. (London), D.Phil. (Oxford)

**J.F. Lawrence**, B.Sc., Ph.D. (Dalhousie)

**R.J. Norstrom**, B.Sc., Ph.D. (Alberta)

**J.A. Ripmeester**, B.Sc., Ph.D. (British Columbia)

**R.E. Sturgeon**, B.Sc., Ph.D. (Carleton)

**D. Wayner**, B.Sc. (McMaster), Ph.D. (Dalhousie)

## Civil and Environmental Engineering

**A.O. Abd El Halim**, B.Sc. (Alexandria), M.A.Sc. (Toronto), Ph.D. (Waterloo), F.C.S.C.E., P.Eng.

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**K.T. Law**, B.Sc., M.Sc. (Eng). (Hong Kong), Ph.D. (Western Ontario), F.E.I.C., F.H. K.I.E., P.Eng.

**W.J. Parker**, B.A.Sc., M.A.Sc., Ph.D. (Waterloo), P.Eng.

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**Paul Van Geel**, B.A.Sc., Ph.D. (Waterloo).

*Adjunct Research Professors*

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**S.E. Chidiac**, B.Eng., M.Eng., Ph.D. (McMaster)

**S.M. Easa**, B.Sc. (Cairo), M.Eng. (McMaster), Ph.D. (California, Berkeley), P.Eng.

**G.Y. Felio**, B.A.Sc. (Ottawa), M.Eng. (Carleton), Ph.D. (Texas), P.Eng.

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**Mostafa Warith**, B.Sc. (Cairo), M.Sc. Ein Shams, M.Eng., Ph.D. (McGill)

**E.W. Wright**, B.A.Sc. (Toronto), M.Sc., Ph.D. (Illinois), P. Eng. Computer Science

## Cognitive Science

Adjunct Research Professors

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**H. Goodluck**, Ph.D. (Univ. Of Massachusetts - Amherst)

**S. Marsh**, B.Sc., Ph.D. (Univ. of Stirling)

**S. Matwin**, M.Sc., Ph.D. (Warsaw)

**J. F. Meech**, B.Sc. (Hons), M.Sc. (Univ. of Manchester)

**M. Montminy**, B.Sc., M.Sc. (Laval), Ph.D. (Montreal)

**C. Reiss**, B.A. (Swarthmore), M.A., Ph.D. (Harvard)

**S. Szpakowicz**, M.Sc., Ph.D. (Warsaw)

**A. Vellino**, B.Sc. (King's College, London), M.Sc. (London School of Economics), Ph.D. (Toronto)

## Comparative Studies in Literature, Art and Culture

**J. Chevalier**, B.Ph. (Ottawa), B.A. (Carleton), Ph.D. (Edinburgh)

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**Albert Halsall**, B.A. (Liverpool), M.A. (McMaster), Ph.D. (St. Andrews)

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**F.G. Loriggio**, B.A. (British Columbia), M.A., Ph.D. (California, Los Angeles)

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Adjunct Research Professors

**J. Bessière**, Docteur d'État (Sorbonne)

**Miguel A. Giella**, B.A. (Carleton), M.A. (Middlebury), Ph.D. (Laval)

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**Christopher Marsden**, B.A., M.A., Ph.D. (Cambridge)

**R. Polzin**, B.A. (San Diego), Ph.D. (Harvard)

**Augusto Ponzio**, Ph.D. (Bari)

**Peter Roster**, B.A., M.A., Ph.D. (Rutgers)

**R.B. Rutland**, B.A. (Toronto), M.A., Ph.D. (London)

**A.T. Tolley**, B.A. (Oxford)

## Computer Science

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**S.P. Dandamudi**, B.E. (Mysore), M.Tech. I.I.T., M.Sc., Ph.D. (Saskatchewan)

**Frank Dehne**, Dipl. Inform. Aachen, Ph.D. (Würzburg)

**D. Deugo**, B.C.S., M.C.S., Ph.D. (Carleton)

**Douglas Howe**, B.A. (Carleton), M.S., Ph.D. (Cornell)

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## Faculty

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### Major Lecture Series

A distinguished series of lectures supported by Carleton University faculties.

#### The Florence Bird Lecture

This annual lecture was established in 1987 to explore the experiences of women in Canada and abroad. It is named in honour of the Hon-ourable Florence Bird, in recognition of her work for the CBC, CIDA, the Royal Commission on the Status of Women in Canada, and the Senate. The lecture is sponsored jointly by the Faculty of Arts and Social Sciences.

#### The Davidson Dunton Research Lecture

Established in 1983, the Davidson Dunton Research Lecture is presented by a Carleton University scholar who is active in research and has achieved international recognition. The lecture is in honour of former Carleton University President Arnold Davidson Dunton.

#### The Gerhard Herzberg Lecture

Established in 1975 by the Faculty of Science, this lecture honours Gerhard Herzberg, a former Chancellor of Carleton University and recipient of the 1971 Nobel Prize for Chemistry. The purpose of the lecture is to emphasize the relationship between science and society and to address an aspect of science which has a pronounced impact on our daily lives.

#### The Marston LaFrance Research Fellowship Lecture

The fellowship was established in 1979 by the Faculty of Arts and Social Sciences in memory of Marston LaFrance, former Professor of English and Dean of Arts at Carleton University. Each year, the recipient presents a seminar or public lecture on some aspect of the research conducted while on the LaFrance fellowship.

#### The John Porter Memorial Lecture

This annual lecture is sponsored by the Faculty of Arts and Social Sciences in memory of John Porter, former Vice-President (Academic) at Carleton University and a distinguished sociologist. The series was established in 1982.

### Special Lectures

Individual lectures sponsored by various academic departments or endowments.

#### The Munro Beattie Lecture

This lecture was established in 1985 in honour of Alexander Munro Beattie, the founder and first Chair of the Department of English, in recognition of his outstanding contribution to Carleton University in teaching, scholarship and administration. The series is sponsored by the Department of English.

#### The Dick and Ruth Bell Lecture

Established in 1988 in honour of the late Dick Bell and Ruth Bell. The lecture will be delivered annually by distinguished scholars in the field of political science or by distinguished persons serving or having served in the public life of Canada or one of its provinces. Supported through the Dick and Ruth Bell Fund.

#### The Edgar and Dorothy Davidson Lecture

The Edgar and Dorothy Davidson Lecture was established in 1983 and is sponsored by the College of the Humanities. The lecture brings a prominent scholar in the area of religious studies and related areas to speak at Carleton.

#### The McMartin Memorial Lecture

The McMartin Memorial Lecture is presented in alternate years by the College of the Humanities at Carleton University and the Faculty of Graduate Studies and Research at the University of Ottawa. The series was established in 1969 and is funded by Mrs. J.P. Gilhooly of Ottawa in memory of her parents, Mr. and Mrs. John McMartin. The lectures involve themes which promote the importance of ethical, moral, and religious standards to education and living.

#### The Adam Mickiewicz Memorial Lecture

Established in 1969, the Adam Mickiewicz Memorial Lecture is presented each year by noted authorities in the area of Soviet and East European Studies. The series is sponsored by Carleton University's Institute of Central/East European and Russian-Area Studies and the Adam Mickiewicz Foundation of Canada to commemorate Poland's foremost poet, Adam Mickiewicz.

#### The H.H.J. Nesbitt Lecture

This annual lecture series was established in 1987 by the Faculty of Science in honour of H.H.J. Nesbitt, Carleton University's first Dean of Science. The lectures are presented by Carleton alumni who have earned international recognition as scientists. The topics are of general interest to the public as well as the scientific community.

### **The Pickering Lecture**

Established in 1975, the Pickering lecture topics focus on problems of developmental and childhood psychology. The Pickering Lecture is sponsored by the Department of Psychology.

### **The Technology, Society, Environment Studies Committee Lecture**

Established in 1981 to sensitize the public to the impact of technology on society and the environment. The lecture is sponsored by the Technology, Society and Environment Studies Committee.

### **The Philip E. Uren Memorial Lecture**

The Philip E. Uren Memorial Lecture is sponsored by the Dean of the Faculty of Public Affairs and Management in memory of Philip Uren, former Director of the Institute of Soviet and East European Studies, the Normal Paterson School of International Affairs, and the Paterson Centre for International Programs at Carleton University. This annual lecture was established in 1982.

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## Notes

## Notes

## Notes

## Notes

## Academic Units and Programs

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Mechanical and	
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Ottawa-Carleton Institute _____	5659
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Philosophy _____	2110
Physics, Ottawa-Carleton Institute _____	4377
Political Economy _____	7414
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Psychology _____	2644
Public Policy and Administration _____	2547
Religion _____	2100
Social Work _____	5601
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